A STUDY OF FUNCTIONAL AND RADIOLOGICAL OUTCOME OF UNIPOLAR AND BIPOLAR HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR

Dissertation

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M.S. ORTHOPAEDICS

BRANCH II

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CERTIFICATE

This is to certify that this dissertation entitled **"A Study Of Functional And Radiological Outcome Of Unipolar And Bipolar Hemiarthroplasty In Fracture Neck of Femur"** is a bonafide record of the work done by **Dr. Faizan Khalid Shah** under guidance and supervision in the Department of Orthopaedics during the period of his postgraduate study for **M.S. Orthopaedics [Branch-II]** from 2015-2018.

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DECLARATION

In the following pages is presented a consolidated report of the study **"A Study Of Functional And Radiological Outcome Of Unipolar And Bipolar Hemiarthroplasty In Fracture Neck Of Femur"** on cases studied and followed up by me at Sree Mookambika Institute of Medical Sciences, Kulasekharam from 2015-2018. This thesis is submitted to the Dr. M.G.R. Medical University, Chennai in partial fulfilment of the rules and regulations for the award of MS Degree examination in Orthopaedics.

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Dr Faizan Khalid Shah

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ABSTRACT

Background and Objectives:

Fracture neck of femur and its complications account for significant morbidity and mortality. Unipolar and bipolar hemiarthroplasty helps in early mobilization of the patient as well as prolonging their productive life.

Materials and methods:

40 patients with intracapsular fracture neck of femur were included in this study. 20 patients were treated with unipolar hemiarthroplasty and 20 patients with bipolar hemiarthroplasty, respectively.

In both the groups, patients were evaluated for functional outcome by using Harris Hip score. Patients were also evaluated radiologically. The Data was analysed by SPSS 20.00 using Chi-square test.

Results

Our overall mean Harris hip score pre operatively for unipolar hemiarthroplasty was 36.2 and bipolar hemiarthroplasty was 39.1 which increased to 81.8 for unipolar and 85.05 for bipolar hemiarthroplasty respectively, with p-value of <0.561. Our results also shows that we have 35% excellent result in Bipolar whereas we have 15% excellent result in unipolar Hemiarthroplasty group.

Conclusion:

The results of our study shows that uncemented bipolar hemiarthroplasty gave better results when compared with uncemented unipolar hemiartheoplasty. Our

results also shows that, cemented bipolar hemiarthroplasty gave better results when compared with cemented unipolar hemiarthroplasty clinically and radiologically. Thus, Bipolar hemiarthroplasty did better when compared with unipolar hemiarthroplasty in general.

Introduction...

INTRODUCTION

The hip joint forms connection between the lower limb and pelvic girdle. The hip joint is designed for stability as well as for a wide range of movements. This multiaxial ball and socket joint allows the entire lower extremity to move in three planes of motion, while providing an important shock absorption function to the torso and upper body.

Pain in the hip joint is one of the most important causes in disabling the human locomotion. There are many ways and methods by which this crippling pain in the hip can be treated.

Hemiarthroplasty is an operation to restore motion and stability to a joint and function to the muscle, ligaments and other soft tissue structures that control the joint. Implanting an artificial femoral stem to replace the fractured one exerted such a profound social impact and enjoyed such a dramatic early success.

Intracapsular fracture neck of femur account for a major share of fractures in the elderly. The primary goal of treatment is to return the patient to his or her pre-fracture functional status.[36]

For displaced fractures of the femoral neck, reduction, compression, and rigid internal fixation are required if union is to be predictable. Because nonunion and osteonecrosis, develop frequently after internal fixation of displaced femoral neck fractures, many surgeons recommend primary prosthetic replacement as an alternative in elderly ambulatory patients.[37]

Prosthetic replacement allows immediate weight bearing to return elderly patients to activity and help avoid complications of recumbency and inactivity. When the concept of prosthetic replacement was first introduced, this perhaps was the most important advantage. As a primary procedure, prosthetic replacement eliminates osteonecrosis and nonunion as complications of femoral neck fractures.[37]

The complications of persistent pain and protrusioacetabuli with unipolar hemiarthroplasties have led many surgeons to choose a bipolar system. Studies suggest that the current generation of bipolar hemiarthroplasties have a lower incidence of protrusioacetabuli than do earlier designs. Some authors have found, however, that the motion of the inner bearing surface may not last, and that all bipolar hips functionally become unipolar implants.

The decision to perform hemiarthroplasty using a unipolar or bipolar prosthesis remains controversial, with proponents on either side. Advantages of the unipolar prosthesis include lower cost and no risk of polyethylene wear debris. Proposed advantages of the bipolar prosthesis include less acetabular wear and potentially less hip/groin pain.[38]

So in view of these varied opinions we desire to compare the efficiency of these two prosthesis unipolar and bipolar prosthesis for the management of intracapsular fractures of neck of femur in elderly people.

In our center both cemented and uncemented unipolar and bipolar hemiarthroplasties were done and we have decided to evaluate the short term functional and radiological outcome of unipolar and Biopolar hemiarthroplasty with a mean follow up of 44.85 months and 44.1 months respectively.

Aim of the Study...

AIM OF THE STUDY

To evaluate the short term functional and radiological outcome of unipolar and Bipolar hemiarthroplasty in intracapsular neck of femur fracture.

Review of Literature...

REVIEW OF LITERATURE

Lausten G.S. Et al (1987)[1], performed a series of 75 patients with 77 Bipolar hip Endoprostheses which were followed up for an average of 51 months post-operatively. All prostheses had been inserted due to Intracapsular fractures of the femoral neck. Average age was 77 yrs, 3 cases of protrusion were found. Functionally 75% of active ambulators had excellent or good results. The authors conclude that: As acetabular erosion and protrusio appear to have been reduced to some extent,

The Bipolar hip prosthesis is a good alternative to conventional Unipolar prothesis in fracture neck of femur in the elderly.

Bochner RM et al(1988)[2],conducted study on 120 patients with Bipolar arthroplasties for fracture of femoral neck and the cases were reviewed. 90 patients followed up for a minimum of 2yrs showed: Free of Major pain-82(91%) Satisfactory Motion & Muscle Power- 83(92%) 75 patients (83%) either returned to the level of function that they had before the fracture or used only a cane, which they had not needed previously. There was no Deterioration of results with time.

Nottage WM et al,[3] conducted a comparative study between Batemans bipolar hip endoprosthesis and unipolar prosthesis. A group of 76 Bateman's Bipolar hip Endoprostheses with a mean follow-up of 32 months was compared with a group of Unipolar Prostheses.

Table 1. Comparative studies on prosthesis with Harris hip score

Prosthesis	Number	Mean follow up	Mean Harris hip Score
Thomson Endoprostheses	36	35 Months	77
Austin Moore	16	31 Months	77
Bateman’s Bipolar	15	32 Months	85

La Belle LW(1990)[4], studied displaced femoral neck fractures in 128 patients were treated with cemented Bipolar (Bateman) prostheses. Follow-up was from 5 to 19 years. 79% of surviving patients had no or slight pain. None of them had Protrusio acetabuli. The authors conclude that when compared with studies of non cemented Moore and Thompson fixed head Prosthesis with the cemented Batemans bipolar prosthesis had less protrusio and less pain.

Gallinaro P et al (1998)[5], studied the results of eighty-eight bipolar Bateman hip endoprostheses for medial femoral neck fractures that were implanted. The average age of the patients was 75 years. Intra hospital results proved the morbidity and mortality rates to be well within acceptable limits. Thirty patients were followed during periods of 12-74 months (median, 33 months). According to Charnley evaluation, mobility was excellent and very good in 20 patients (86%). Good function was present in 63% of patients. The majority of patients belonged to category C as defined by Charnley. Mild pain was present in 19 patients (63%); in only two cases, involving severe rheumatoid arthritis, pain was clearly related to the sinkage. Radiographically, no visible protrusion or socket wear was present. Periarticular ossification occurred in 19 patients, but this did not impair function.

Charles N. Cornell and David Levine[6] in their study of unipolar versus bipolar hemiarthroplasty for the treatment of femoral neck fractures in the elderly, in 47 patients with an average of 77 years concluded that there is no differences in the hip rating outcome between unipolar and bipolar hemiarthroplasty.

Yamagata M et al (1987)[7], did a retrospective review of 1,001 hip hemiarthroplasties. The prosthetic designs were grouped into fixed-head types (682 cases) and bipolar types (319 cases) for comparison. The main indications for operation were femoral neck fracture and avascular necrosis of the femoral head. Both prosthetic types are useful in hip surgery, but the Bipolar type appears to be indicated in younger and more active patients, whereas the fixed head design is more suitable for older patients with femoral neck fractures.

Raia et al (2003)[8] did a comparative study for the efficacy of unipolar versus bipolar hemiarthroplasty in elderly patients (> 65 years) with displaced femoral neck fractures in terms of quality of life and functional outcomes. Results of this prospective randomized study, suggest that the bipolar endoprosthesis provides no advantage in the treatment of displaced femoral neck fractures in elderly patients regarding quality of life and functional outcomes.

Lestrange and Nile R (1990)[9], did a study on four hundred ninety-six bipolar arthroplasties which were performed over a 14-year period for the treatment of proximal femur fractures. A historical review, including 71 references from the 19th century to the present, was composed concerning the advances in operative techniques for the treatment of such fractures. Comparisons were then made between this series and those that used internal fixation and one-piece conventional prostheses. Immediate postoperative and long-term follow-up study results confirm findings of a previous smaller study. That previous study showed the bipolar prosthesis offered significant improvement over internal fixation in reducing morbidity and mortality. Additionally, it offered advantages over the one-piece prosthesis in terms of fit, decreased acetabular erosion, and improved function.

Nottage et al (1990)[10], did a retrospective study of 76 Bateman universal proximal femoral endoprostheses with a mean follow-up period of 32 months was compared to a group of 36 Thompson endoprostheses and 16 Moore endoprostheses, with a mean follow-up period of 35 months and 31 months, respectively. Harris hip scores, when corrected for preoperatively of impaired function, yielded a mean score of 85 for the Bateman group, compared to a mean of 77 for both the Thompson and Moore groups. Fifteen patients received the Bateman device for reconstructive purposes and had a mean Harris hip score of 90. Morbidity was comparable between the Bateman and Thompson groups. The deep-infection rate was 3.9%, and the 32-day perioperative mortality was 4.6%, rising to 29% at the time of review. Preselection factors placed younger, more functional patients in the Bateman group (mean age, 65 years; mortality, 11%), compared to the Thompson group (mean age, 72 years; mortality, 39%) and the Moore group (mean age, 73 years; mortality, 41%). Continued evaluation of the

Bateman endoprosthesis is required to better define its potential to lessen the long-term problems of pain, loosening, and acetabular wear.

Moshein et al[11] reported that moderate to severe postoperative pain was reduced to 12% with the bipolar implant as compared with 42% pain persistence with Moore prosthesis.

Lavernia C and Lyon R,[12] did a retrospective study which assessed the economic impact of prosthetic selection in the treatment of displaced intracapsular fractures. The records of 28 patients were divided into two groups: 16 patients who received an Austin-Moore non modular device and 12 patients (6 men and 6 women; mean age, 77 years) who received a modular, bipolar device. The bipolar group had significantly greater mean operative times, total charges for the device, and total charges for supplies. Surgeons treating hip fractures; should consider implant cost, functional outcome, and patient demands when selecting a prosthesis for hemiarthroplasty care.

Jadhav AP et al (1996),[13] had done forty cases of Austin Moore Replacement (AMR) for transcervical fractures of femur in patients and cases were reviewed after a period of 12 to 48 months post operatively (mean 26 months). They felt that AMR should be reserved for more than 65 years of age and those who are less active or debilitated because of other factors, because of increased acetabular wear with time in the younger individual. This is corroborated by unsatisfactory results in patients less than 65 years of age ($p<0.05$).

ANATOMY OF HIP JOINT

The hip-joint is a ball-and-socket articulation, formed by the reception of the head of the femur into the cup-shaped fossa of the Acetabulum. The articular surface of the acetabulum is horse-shoe shapes and it is deficient inferiorly at the acetabular notch. The articular surfaces are covered with hyaline cartilage[14]. The cavity of the acetabulum is deepened by the presence of a fibrocartilaginous rim called the acetabular labrum. It is triangular on cross-section; the base is attached to the edge of the acetabulum, and the apex corresponds with the free margin of the labrum; the latter is in- turned so as to constrict the rim of the acetabular cavity, which closely embraces the head of the femur and assists in holding it in its place.

The hip joint is enclosed by a capsule which is attached to the acetabular labrum medially. Laterally, it is attached to the intertrochanteric line of the femur in front and halfway along the posterior aspect of the neck of femur. The capsular ligament is much thicker at the upper and forepart of the joint, where the greatest amount of resistance is required; behind and below, it is thin and only loosely connected to the bone. The ligaments of the joint are: iliofemoral, pubofemoral, ligament of the head of the femur, ischiofemoral and transverse acetabular.

The iliofemoral ligament is a strong inverted Y- shaped ligament. Its base is attached to the anterior inferior iliac spine superiorly. Inferiorly, the two limbs of the Y are attached to the upper and lower parts of the intertrochanteric line of the femur. This very strong ligament prevents over-extension during standing.[14]

The pubofemoral ligament is triangular in shape. The base of the ligament is attached to the superior ramus of the pubis and the apex is attached below to the lower part of the intertrochanteric line. This ligament limits extension and abduction. The ischiofemoral ligament is spiral in shape and is attached to the body of the ischium near the acetabular margin. The fibers pass upward and laterally and are attached to the greater trochanter. This ligament limits extension.

The transverse acetabular ligament is formed by the acetabular notch. The ligament converts the notch into a tunnel through which the blood vessels and nerves enter the joint. The ligament of the head of the femur is flat and triangular in shape. It is attached by its apex to the pit on the head of femur and by its base to the transverse ligament and the margins of the acetabular notch. It lies within the joint and is ensheathed by the synovial membrane.

The muscles in relation with the joint are: in front, the straight head of rectus femoris, the iliacus and the psoas major(separated from Capsule by bursa) and the pectineus; above, the reflected head of the rectus femoris and the insertion of gluteus minimus, the latter being closely adherent to the capsule; below, the obturator externus and pectineus; behind, the piriformis, gemellus superior, tendon of obturator internus, gemellus inferior, tendon of obturator externus, and quadratus femoris.[14] The arteries supplying the joint are derived from the obturator, medial circumflex femoral, and superior and inferior gluteal arteries.

Anterior View

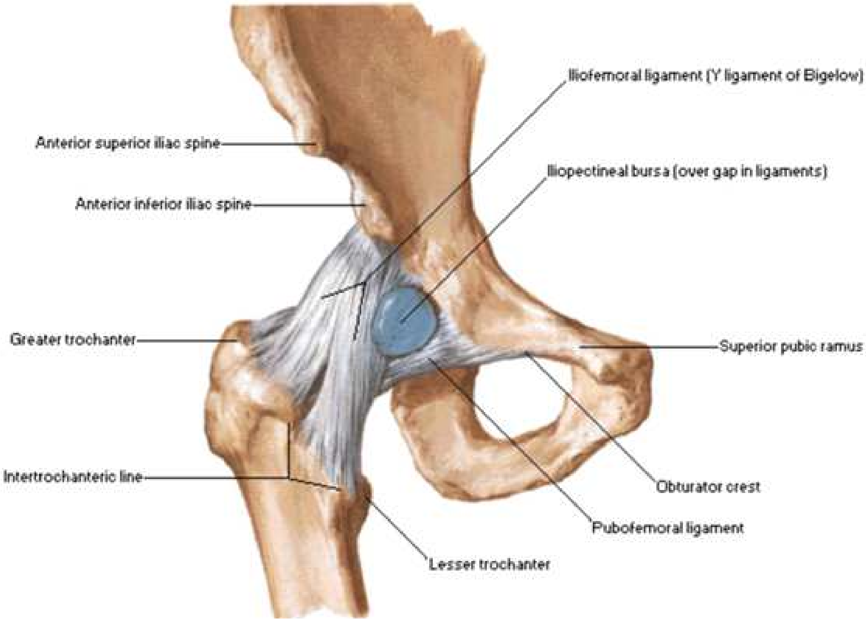


Fig 1. Hip joint

Lateral View

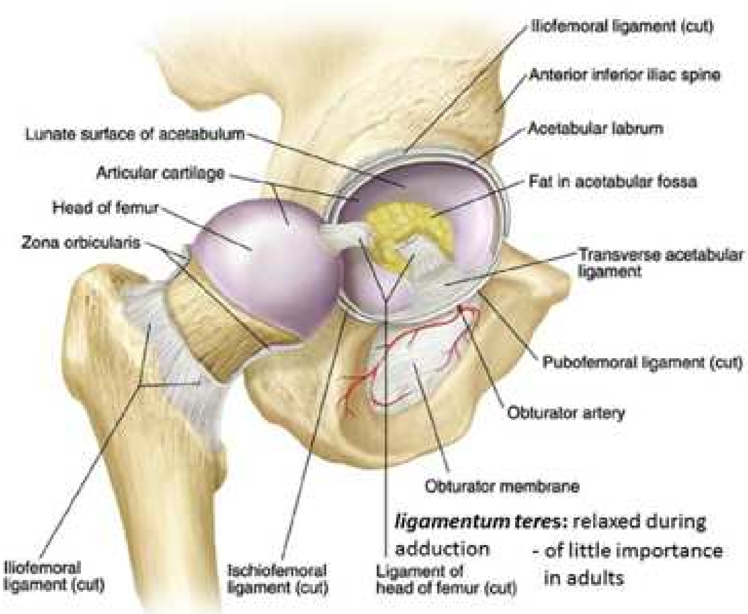


Fig 2. Hip joint (opened)

The nerves are articular branches from the sacral plexus, the sciatic, obturator, and accessory obturator nerves, a branch from, the nerve to the quadratus femoris, and a filament from the branch of the femoral nerve supplying the rectus femoris. Muscles producing the movements:

1. Flexion - Psoas major, Iliacus, Pectineus, Rectus femoris, Sartorius, Adductors.
2. Extension - Gluteus maximus, Biceps femoris, Semitendinosus, Semi-membranosus.
3. Abduction - Glutei medius, Glutei minimus, Sartorius, Tensor fascia latae.
4. Adduction - Adductors longus, brevis and magnus, Pectineus, Gracilis.
5. Medial rotation - Glutei medius and minimus (anterior fibers), Tensor fascia latae.
6. Lateral rotation - Piriformis, Obturators, Gaemelli, Quadratus femoris, Adductors, Sartorius.

The length of the neck of the femur and its inclination to the body of the bone has the effect of converting the angular movements of flexion, extension, adduction, and abduction partially into rotator movements in the joint. Thus when the thigh is flexed or extended, the head of the femur rotates within the acetabulum around a transverse axis. Rotation of the thigh is not a simple rotation of the head of the femur in the acetabulum, but is accompanied by a certain amount of gliding. The axis of the movement is a vertical line which passes through the center of the head of the femur and the inter condylar notch. In the hip-joint, the head of the femur is closely fitted to the acetabulum for an area extending over nearly half a sphere, and at the margin of the bony cup it is still more closely embraced by the acetabular labrum, so that the head of the femur is held in its place by that ligament even when the fibers of the capsule have been quite divided.[14]

BLOOD SUPPLY[39]

The blood supply of the hip joint is of particular relevance when considering intracapsular hip fractures. The anatomy has been well described.[43] There are three sources: capsular vessels, intramedullary vessels, and a contribution from the ligamentum teres. In the adult the most important source of femoral head blood supply is derived from capsular vessels. These vessels arise from the medial and lateral circumflex femoral arteries. These are in turn branches of the profunda femoris in 79% of patients. In 20% of patients one or other of the vessels arises from the femoral artery, and in the remaining 1% both vessels arise from the femoral artery. The medial and lateral femoral circumflex arteries form an extracapsular circular anastomosis at the base of the femoral neck, and the ascending cervical capsular vessels arise from this. They penetrate the anterior capsule at the base of the neck at the level of the intertrochanteric line. On the posterior aspect of the neck they pass beneath the orbicular fibers of the capsule to run up the neck under the synovial reflection to reach the articular surface. Within the capsule these are referred to as retinacular vessels. There are four main groups (anterior, medial, lateral, and posterior), of which the lateral group is the largest contributor to femoral head blood supply. The most important retinacular vessels arise from the deep branch of the medial femoral circumflex artery. These vessels supply the main weight-bearing area of the femoral head. The contributions of the lateral femoral circumflex artery and metaphyseal vessels are much less important by comparison. At the junction of the articular surface of the head with the femoral neck there is a second ring anastomosis termed the subsynovial intra-articular ring. The terminal branches of the deep branch of the medial femoral circumflex artery penetrate the femoral head 2 to 4 mm proximal to the articular surface on its postero-superior aspect.

These capsular vessels are vulnerable to damage in displaced subcapital fractures. They enter the femoral head just below the articular margin. Displacement of the femoral head because of a fracture in this area will damage these vessels, jeopardizing the blood supply to the femoral head and resulting in an increased risk of avascular necrosis if the head is retained. Claffey has shown that the risk of avascular necrosis is greatly increased if the important lateral retinacular vessels are damaged.

The artery of the ligamentum teres is a branch of the obturator or medial femoral circumflex artery. Some additional blood supply in the adult reaches the head via the medullary bone in the neck. Clearly these latter vessels will be as vulnerable to disruption in any displaced fractures as are the retinacular vessels. Although the vessels entering the head through the ligamentum teres contribute to femoral head blood supply, their contribution is generally not sufficient to maintain complete vascularity of the entire head.[47] After a displaced fracture, re-vascularization of the femoral head occurs by revascularisation from areas of the head with retained blood supply and in growth of vessels from the metaphysis. The portion of the femoral neck within the hip joint capsule has no cambial layer in its fibrous covering to participate in callus formation during fracture healing. Fracture union depends on endosteal healing alone, which is one of the reasons prolonged union times are commonly seen in these fractures.

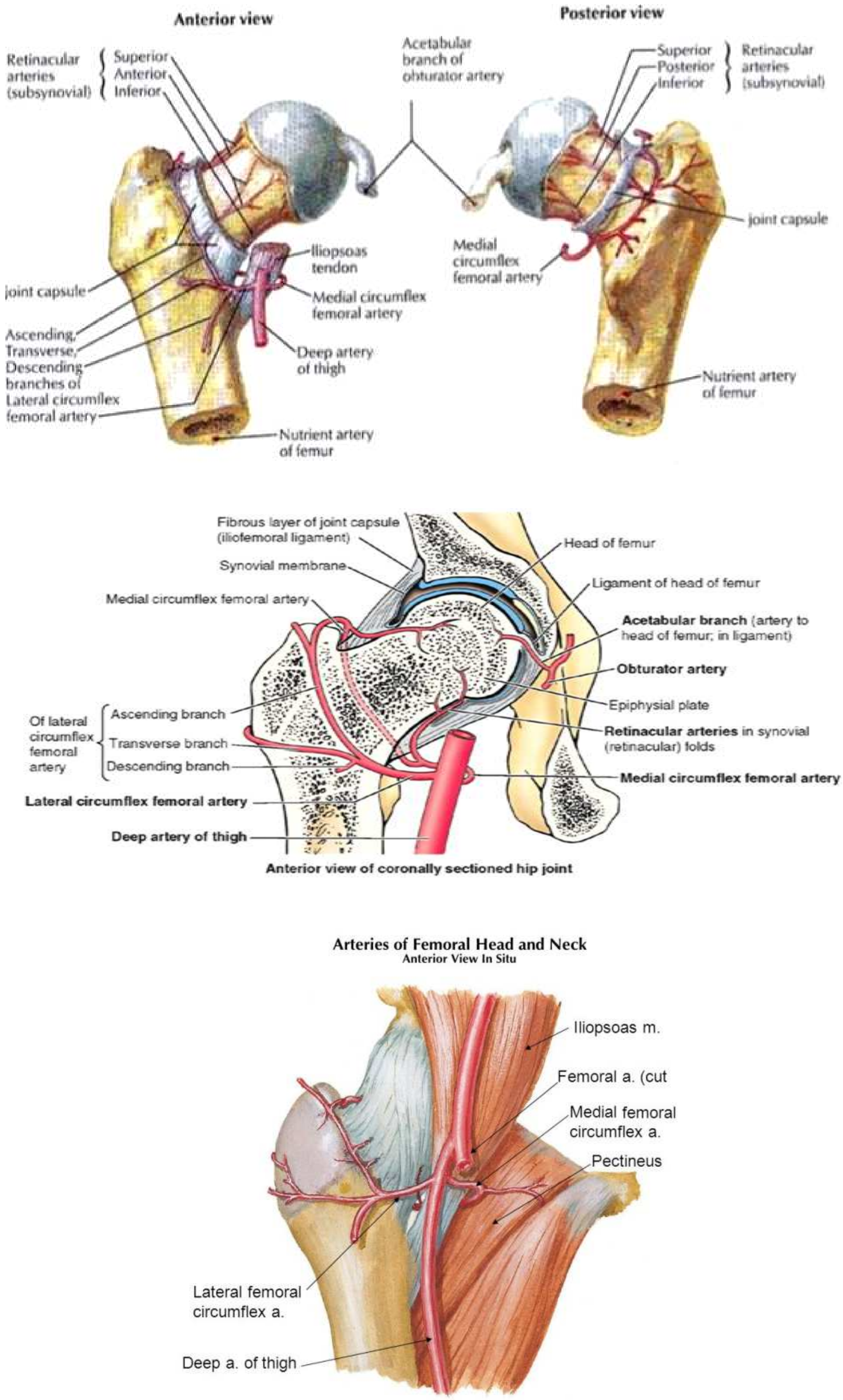


Fig 3. Blood supply of head and neck of Femur

FEMORAL NECK FRACTURES

Fractures of the neck of the femur occur predominantly in the elderly, typically result from low-energy falls, and may be associated with osteoporosis. Fractures of the femoral neck in the young are a very different injury and are treated in very different ways. Femoral neck fractures in young patients typically are the result of a high-energy mechanism and associated injuries are common. Most fractures of the femoral neck are intracapsular and may compromise the tenuous bloody supply to the femoral head. Basicervical femoral neck fractures are extracapsular femoral neck fractures and often are considered with intertrochanteric femoral fractures.

Anatomical Classification

The anatomical classification is based on the location of the fractural line which can either be subcapital i.e., just beneath the head of femur, transcervical ie, the fractural line within the neck of femur. Basicervical ie, the fractural line at the base of the neck of femur.

Subcapital **Transcervical** **Basicervical**

Fig 4. The anatomical Classification of femoral neck fractures by location

Garden's classification:

The Garden classification is based on the degree of valgus displacement.

Type I: Incomplete/valgus impacted

Type II: Complete and nondisplaced on AP and lateral views

Type III: Complete with partial displacement; trabecular pattern of the femoral head does not line up with that of the acetabulum

Type IV: Completely displaced; trabecular pattern of the head assumes a parallel orientation with that of the acetabulum

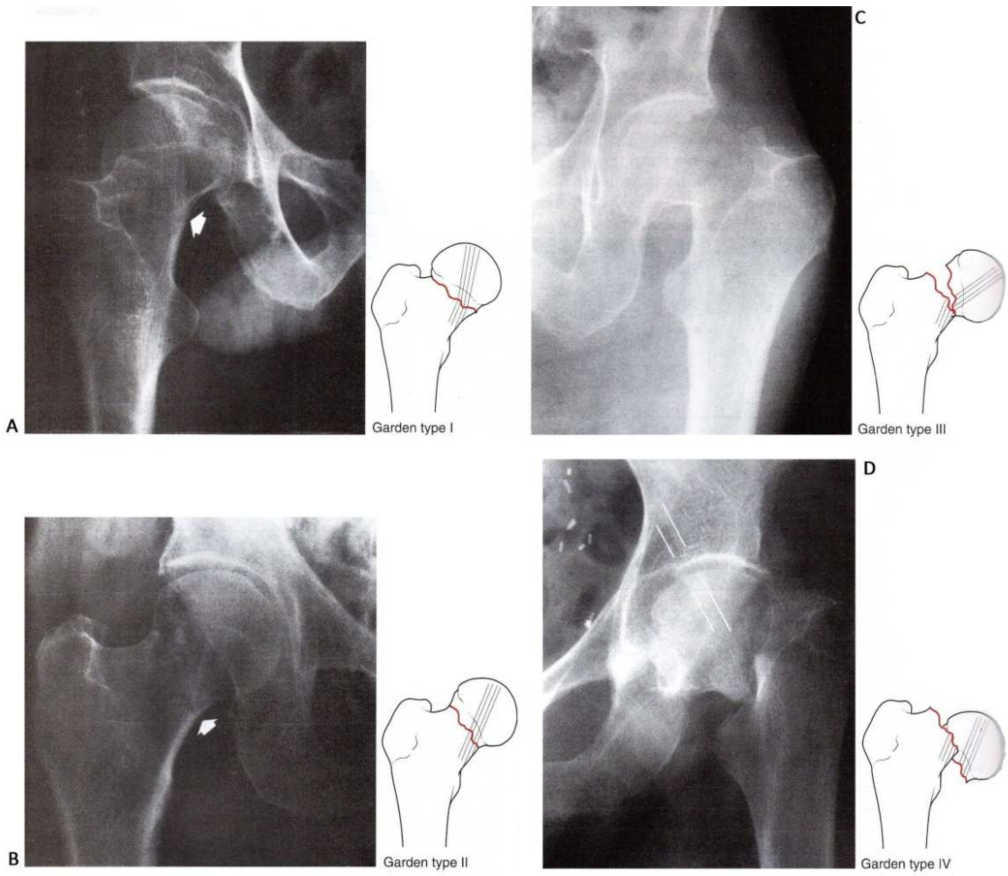


Fig 5. The Garden classification of femoral neck fractures. Type I fractures can be incomplete, but much more typically they are impacted into valgus, and retroversion (A). Type II fractures are complete, but undisplaced. These rare fractures have a break in the trabeculations, but no shift in alignment (B). Type III fractures have marked angulation, but usually minimal to no proximal translation of the shaft (C). In the Garden type IV fracture, there is complete displacement between fragments and the shaft translates proximally (D). The head is free to realign itself within the acetabulum, and the primary compressive trabeculae of the head and acetabulum realign (white lines)[58]

The Pauwels classification:

The Pauwels classification is based on the angle of fracture from the horizontal

Type I: <30 degrees

Type II: 31 to 70 degrees

Type III: > 70 degrees

Increasing shear forces with increasing angle leads to more fracture inability

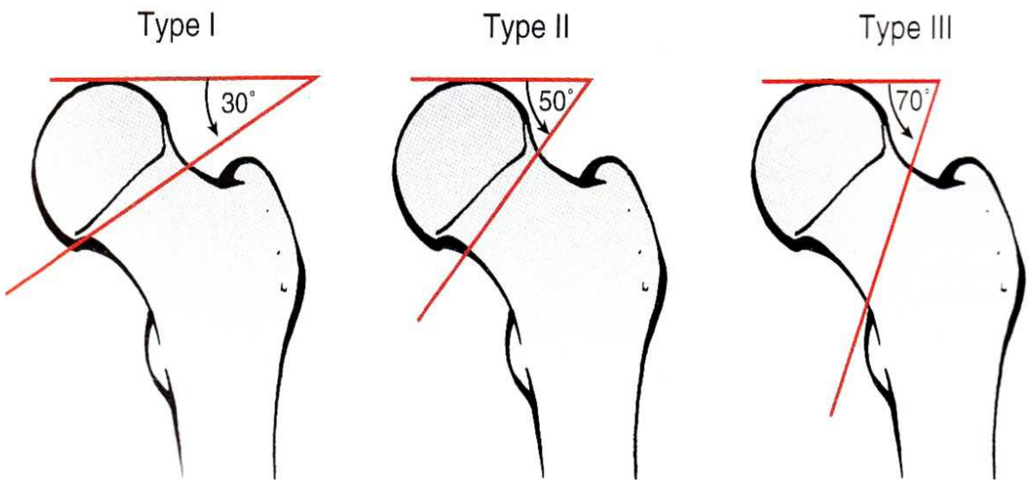


Fig 6. Pauwel classification of femoral neck fractures

The Pauwel classification of femoral neck fractures is based on the angle the fracture forms with the horizontal plane. As fracture type progresses from type I to type III, the obliquity of the fracture line increases, and, theoretically, the shear forces at the fracture site also increase.

APPLIED BIO MECHANICS

The hip joint functions on the Bio-engineering principle of moment force with a fulcrum, lever arm and power arm. Hip joint with its semi-spherical head articulating within the acetabular cup with the adductor muscles acting at one end, the body weight acting on the other, and the head itself being the fulcrum. This can be compared to the 1st order lever.

FORCES ACTING ON THE HIP[15]

To describe the forces acting on the hip joint, the body weight can be depicted as a load applied to a lever arm extending from the body's center of gravity to the center of the femoral head.

The abductor musculature, acting on a lever arm extending from the lateral aspect of the greater trochanter to the center of the femoral head, must exert an equal moment to hold the pelvis level when in a one-legged stance, and a greater 'moment to tilt the pelvis to the same side when walking or running. Since the ratio of the length of the lever arm of the body weight to that of the abductor musculature is about 2.5:1, the force of the abductor muscles must approximate 2.5 times the body weight to maintain the pelvis level when standing on one leg.

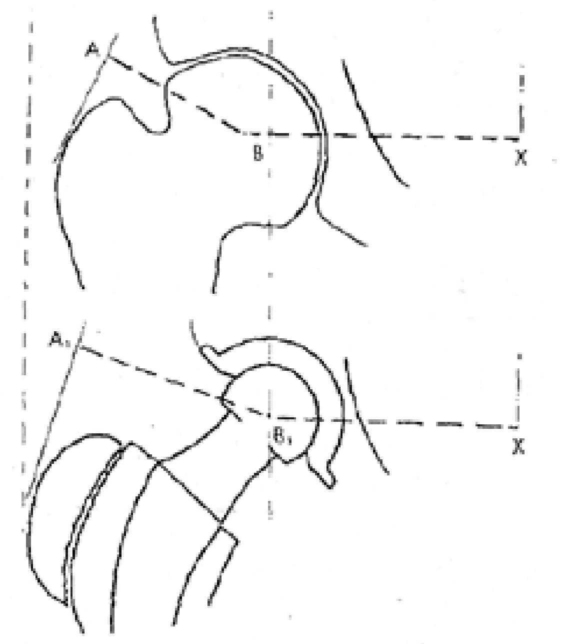


Fig 7. Forces acting on the hip

Moment produced by body weight applied at body's center of gravity, X, acting on lever arm, B - X, must be counterbalanced by moment produced by abductors. A acting on shorter lever arm. A- B Lever arm A- B may be shorter than normal in arthritic hip. Centralization of head shortens lever arm B-X, and lateral reattachment of trochanter lengthens lever arm A - B.

When lifting, running or jumping, the load may be equivalent to 10 times the body weight. Therefore, excess body weight and increased physical activity add significantly to the forces that act to loosen, bend or break the stem of a femoral component.[15]

The forces on the joint act not only in the coronal plane but, because the body's center of gravity (in the midline, anterior to the body of S2) is posterior to the axis of the joint, also in the saggital plane to bend the stem posteriorly.

These 2 forces combine to produce a torsion effect on the stem. Since half the body weight acts medially and posterior to the axis of the hip joint, fractures of the stem usually start on the anterolateral aspect. Torsional stability may be increased by increasing the width of the proximal portion of the stem to better fill the metaphysis. It can also be attained by retaining the neck segment.

From the above discussion, it is clear that we can reduce the forces passing through the hip joint by

1. Decreasing the length of the body lever arm.
2. Increasing the length of the abductor lever arm.

This can be achieved by

a. Lateral reattachment of the osteotomized greater trochanter.

b. Increasing the offset between the femoral head and stem.

Lateral reattachment of the osteotomized Greater trochanter will increase the abductor lever arm. This procedure is not followed in each and every case because the weakness of the abductors caused by surgical trauma, infection, nonunion and proximal displacement of the trochanter not only tends to make the hip unstable, but also increases the incidence of loosening and failure of the prosthetic stem.

Now a days osteotomy of the greater trochanter is not being done to avoid problems caused by reattachment and as adequate exposure can be obtained without trochanteric osteotomy.

PLANE OF FORCES ON HIP JOINT

While standing, center of gravity is posterior to axis of hip joint.

I. View of pelvis from superior margin of symphysis pubis to level of sacral ala. Acetabulum are outlined and center of gravity is at X.

II. Center of gravity, X is anterior to S2 vertebrae, although center of gravity is not fixed and changes with movement of upper body with respect to pelvis. Because hip joints are distal and anterior to X, rotatory and posterior bending forces, in addition to force in coronal plane, are applied and tend to rotate bend prosthetic stem.[15]

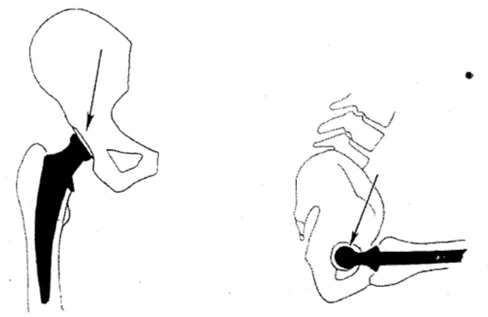


Fig 8. Force producing torsion of the stem

1 Forces acting on hip in coronal plane tend to deflect stem medially.

2 Forces acting in saggital plane especially with hip flexed (or) when lifting tends to defect stem posteriorly combined they produce a torsion of the stem.

Femoral Head and the Femoral Offset

For a given angle between the neck and femoral shaft, the greater the length I, of neck segment of the femoral component, greater will be the lever arm or the moment of force that tends to bend or break the component.

SURGICAL APPROACHES:

The commonly used approaches in hemiarthroplasty are :

1. Posterior approach
2. Lateral approach

Posterior approach[15]

Popularized by Moore and it is often called the southern approach. The patient is placed in the true lateral position with the affected limb uppermost. Make a 10 to 15 cm curved incision on the posterior aspect of the greater trochanter. Beginning the incision some 6 to 8 cm above and posterior to the posterior aspect of the greater trochanter. The part of the incision that runs from this point to the posterior aspect of the trochanter is in line with the fibres of the gluteus maximus. Curve the incision across the buttock, cutting over the posterior aspect of the trochanter and continue down along the shaft of femur. Incise the fascia lata on the lateral aspect of the femur to uncover the vastus lateralis. Lengthen the fascial aspect of the femur to uncover the vastus lateralis.

Lengthen the fascial incision superiorly in line with the skin incision and split the fibers of the gluteus maximus by blunt dissection. Retract the fibers of the split gluteus maximus and the deep fascia of the thigh. Underneath is the posterolateral aspect of the hip joint, still covered by the short external rotator muscles. Internally rotate the hip to put external rotator muscles on a stretch. Insert stay sutures into the piriformis and obturator internus tendons just before they insert into the greater trochanter. Detach the muscles close to their femoral insertion and reflect them backward. The posterior aspect of the hip joint capsule is now fully exposed.

The hip joint capsule is incised with a longitudinal or T-shaped incision. Dislocation of hip is achieved by flexion, internal rotation and adduction. Now removal of the femoral head and neck is done.

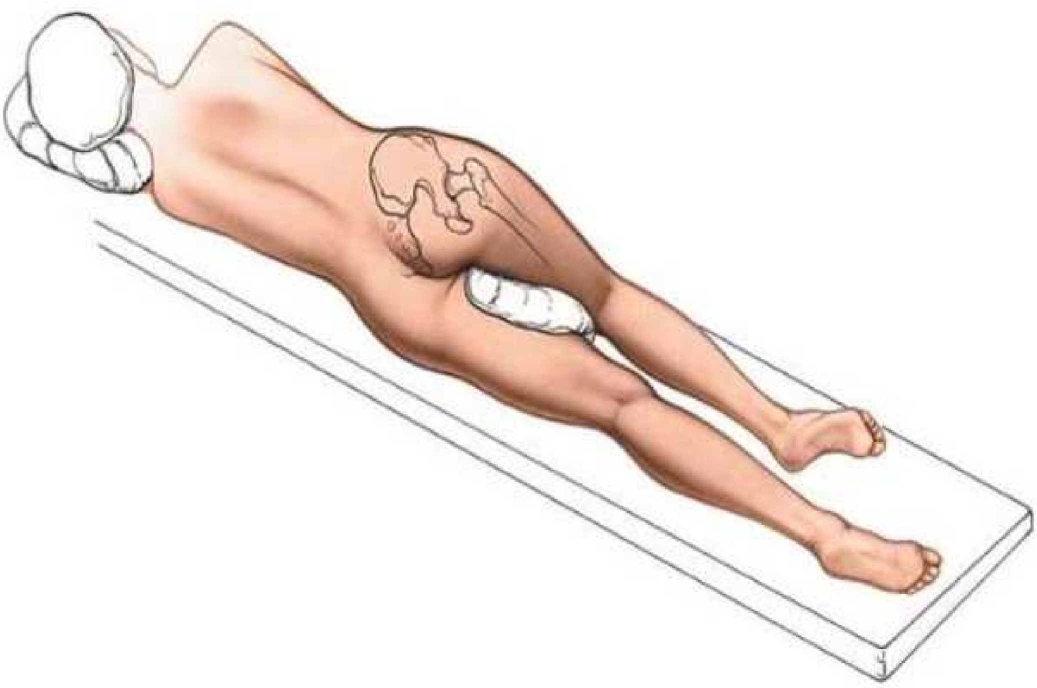


Fig 9. Position of the patient on the operating table for the posterior approach to the hip joint.

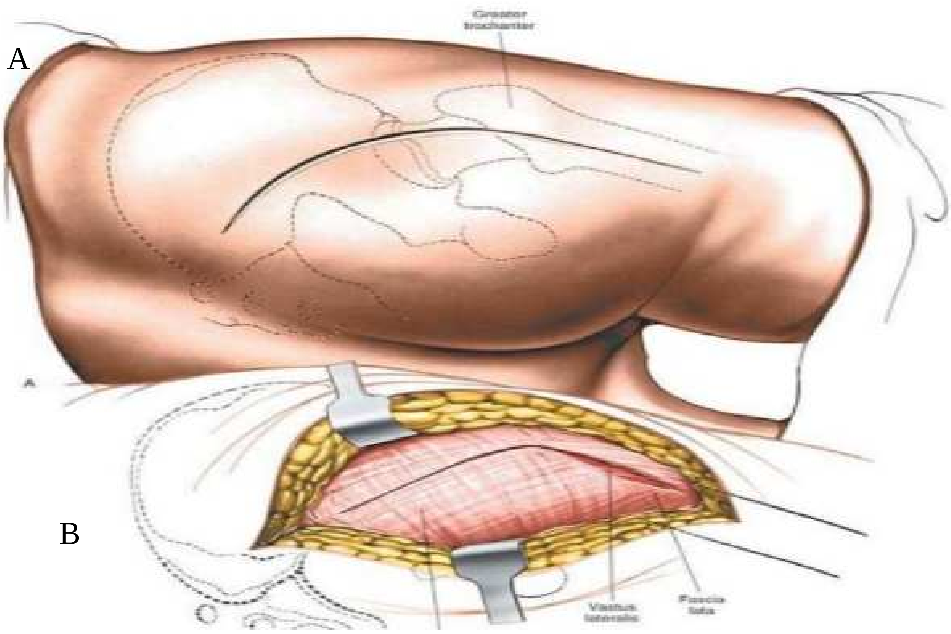


Fig 10. A. Image showing Skin incision for the posterior approach to the hip joint
B. Image showing the Incision over the facia lata

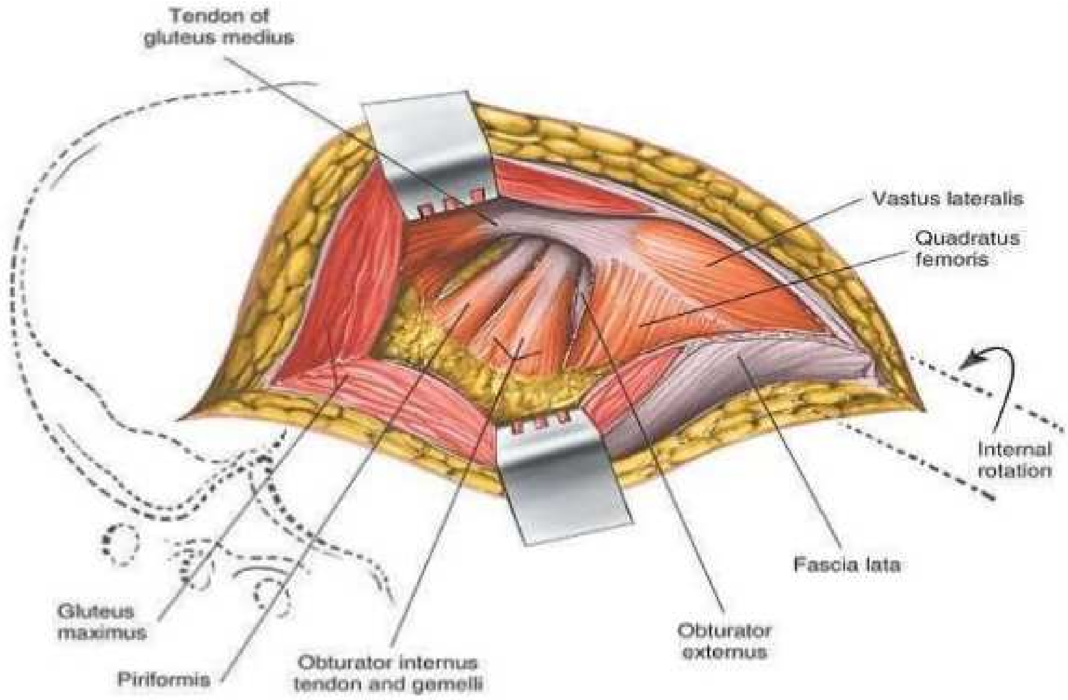


Fig 11. Push the fat posteriomedially to expose the insertions of the short rotators. Note that the sciatic nerve is not visible; it lies within the substance of the fatty tissue. Place your retractors within the substance of the gluteus maximus superficial to the fatty tissue.

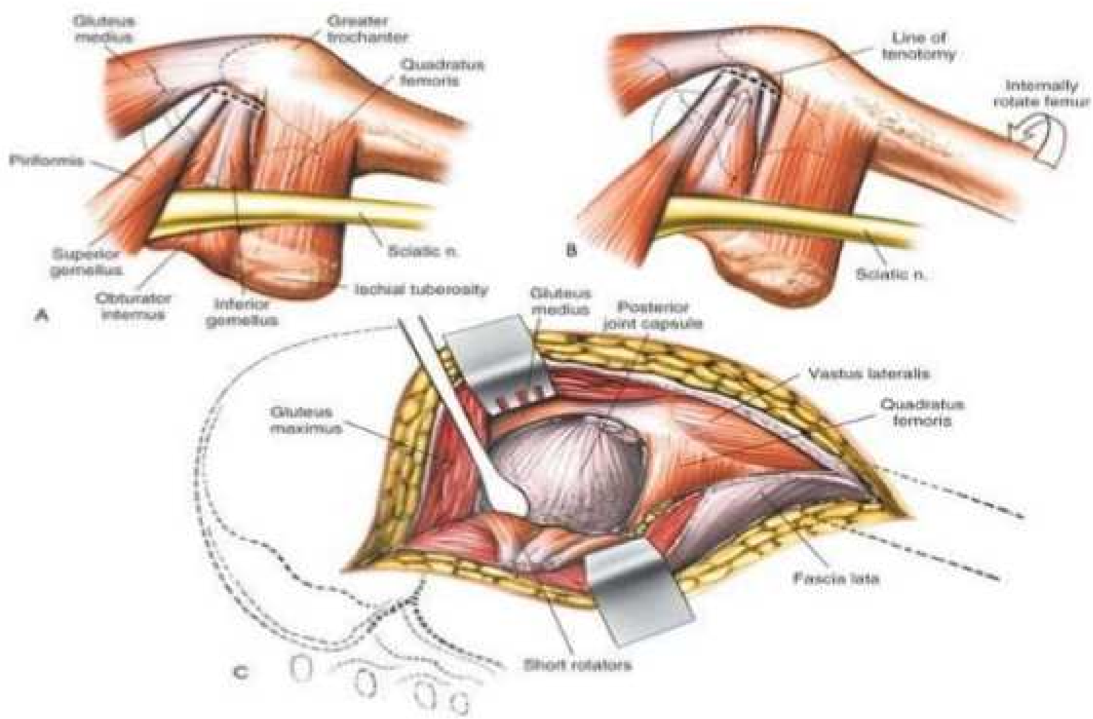


Fig 12. (A,B). Internally rotate the femur to bring the insertion of the short rotators of the hip as far lateral to the sciatic nerve as possible. (C). Detach the short rotator muscles close to their femoral insertion and reflect them backward, laying them over the sciatic nerve to protect it.

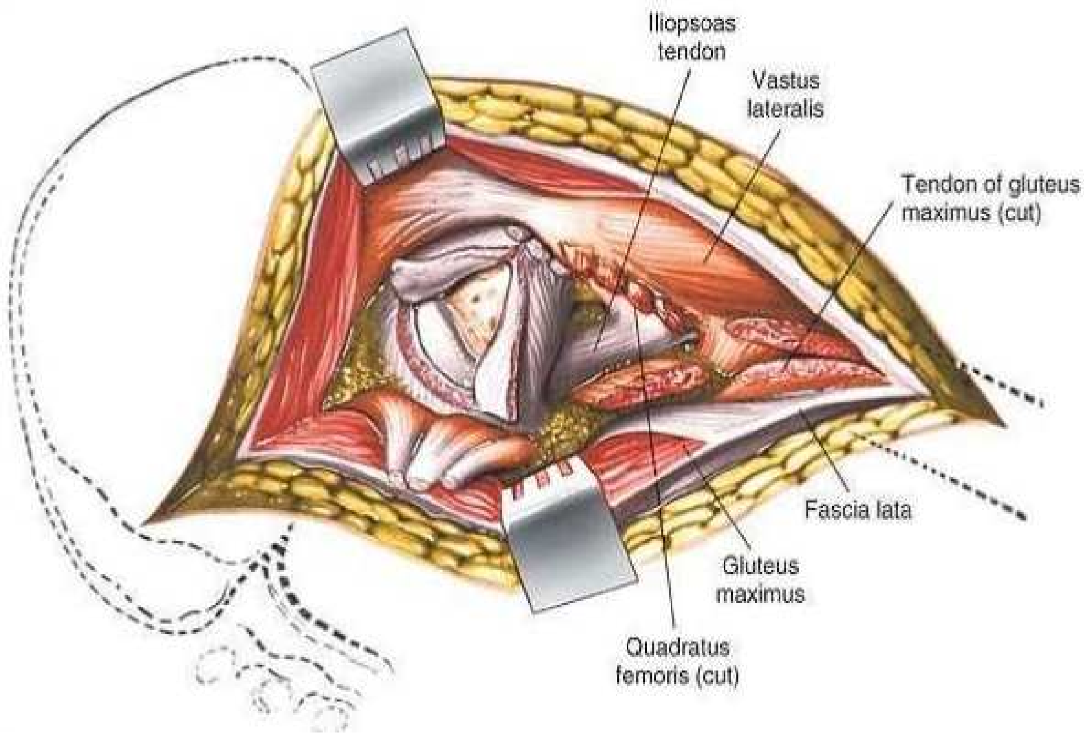


Fig 13. To gain additional exposure, cut the quadratus femoris and the tendinous insertion of the gluteus maximus

Lateral Approach[15]

This is also a commonly used approach. A midlateral incision is made, centered over the greater trochanter and extending from the level of the anterior iliac spine to a point 60 cms below the greater trochanter. The fascia lata is incised along the posterior margin of the greater trochanter and continued proximally and distally in the line of the skin incision. The gluteus medius and its insertion into the greater trochanter is identified. This is facilitated by internal rotation of the hip. The muscle is split in the direction of its fibres at the junction of the anterior and middle thirds. This split is carried proximally 4cm from the posterosuperior tip of the greater trochanter. An incision is then made down to the bone over the trochanter, carried slightly anteriorly and then continued distally into the vastus lateralis along the anterolateral surface of the femur, for a distance of 5cms. The attachment of gluteus medius to the trochanter, with the periosteum and fascia of the vastus lateralis, is then lifted as a single layer from the anterior portion of the trochanter using a sharp chisel. The combined muscle mass is displaced forward.

The tendon of gluteus minimus is then divided and the capsule of the hip joint exposed. After exposure of the anterior capsule a retractor is placed over the pelvic brim, deep to the rectus femoris and capsule is dissected off the acetabular margin. With a generous capsular T shaped incision it is possible to dislocate the hip anteriorly with relative ease, after removal of the femoral head and neck.

IMPLANTATION OF CEMENTED FEMORAL COMPONENT[15]

Cement fixation is particularly indicated in patients with a physiological age greater than 65 years and when the femoral cortex is thin or osteoporotic and a secure press-fit fixation is unlikely.

Insert the broaches in Approximately 15 degrees of anteversion in relation to the axis of the knee. Maintain correct axial alignment as the broach is inserted. Alternately impact and extract the broach to facilitate its passage. Because fixation will be achieved with cement, the requirements for absolute stability of the broach are not rigorous as with cementless techniques. If resistance is felt during insertion of the broach, then the area of impingement is most likely distally within the diaphysis. The broach cannot be used to prepare cortical bone in the diaphysis. Do not attempt to impact the broach further because a femoral fracture may occur or the broach may become incarcerated.

Carry out a trial reduction with the prosthesis without cement to determine the limb length. Since the stem is to be fixed with cement, the depth of insertion of the component is predetermined at this point. When final component sizes have been elected and limb length and stability have been assessed, dislocate the hip and remove the trial implant.

Remove remaining loose cancellous bone from the medial aspect of proximal femur using straight and angled curettes. Do not touch the stem or allow contamination with blood or debris, because this may compromise the cement-implant interface after implantation. Now change outer gloves and begin preparation of cement. Mix 2 packages of cement for a standard size femoral stem. The cement is molded into the shape of a sausage and is held in the palm of one hand or in an open plastic container. A medullary plug is not used, for it will trap air and blood in the distal end of the canal. The cement is pushed into the canal with the index finger or thumb of the opposite hand. It is pushed as far distally as the finger will reach. Care should be taken to avoid mixing blood with cement and to keep the bolus of cement intact. After the cavity has been filled, the cement is pressed with the thumb. A mechanical impactor or plunger may be used.

A small plastic suction tube may be placed in the femoral canal to allow air and blood to escape while the cement is being inserted and to reduce the hydrostatic pressure.

Have the femoral component immediately available for insertion. Determine the desired amount of anteversion and the medial/lateral position of the stem before insertion. Hold the stem by the head and insert it manually at first. Insert the tip of the stem within the centre of the cement mantle. Use firm even pressure to insert the stem. Have a plastic-tipped head impactor and a mallet immediately available to complete the seating of the stem. Remove the cement from the region of the collar to be certain that the stem has been fully inserted and, if not, impact it further.

Maintain firm pressure on the head of the component as the cement hardens. As the cement enters a doughy phase, cut the cement around the edges of the prosthesis and carefully remove it from the operative field. Do not pull the cement from beneath the component or proximal support may be lost. Carefully inspect the anterior aspect of the femoral neck to be sure no cement protrudes where it may cause impingement and dislocation. Recheck the positioning and the stability of the femoral component. If there is any detectable motion or if fluid extrudes in the bone-cement interface with movement, then it is unstable and must be replaced. If it appears satisfactory, then reduce the hip and check the stability of the hemiarthroplasty.

IMPLANTATION OF CEMENTLESS (UNCEMENTED) FEMORAL COMPONENT[15]

Insert the reamer at a point corresponding to the piriformis fossa. The insertion point is slightly posterior and lateral on the cut surface of the femoral neck. An aberrant insertion point will not allow access to the center of the medullary canal. After the point of the reamer has been inserted, direct the handle laterally towards the greater trochanter. Aim the reamer down the femur towards the medial femoral condyle. If this cannot be accomplished, remove additional bone from the medial aspect of the greater trochanter, or varus positioning of the femoral component will result. Use rongeur, a box chisel, or a specialized trochanter reamer for this purpose. Generally, a groove must be made in the medial aspect of the greater trochanter to allow proper axial reaming of the canal. Insert the reamer to a predetermined point. Then determine the proper depth of insertion of the reamer.

Assess the stability of the axial reamer within the canal. No deflection of the tip of the reamer in any plane should be possible. Now proceed with the preparation of the proximal portion of femur. Remove the residual cancellous bone along the medial aspect of neck with broaches. Place the broach precisely as the axial reamers. Rotate the broach to control anteversion. Seat the final to a point where it becomes axially stable within the canal and will not advance further.

Perform this manoeuvre after full muscular relaxation has been obtained. Irrigate any debris out of the acetabulum.

Insert the appropriate size femoral component. Insert the stem to within a few centimeters of complete seating by hand. Be certain to reproduce the precise degree of anteversion determined by the driving device provided with the system or a plastic tipped pusher. Use blow of equal force as the component is seated. As the component nears complete seating, it will advance in smaller increments with each blow of the mallet. An audible change in pitch usually can be detected as the stem nears final seating. Remove any debris from the acetabulum and again reduce the hip. Make sure that no soft tissues have been reduced into the joint. Confirm the stability of the hemiarthroplasty through a full range of motion.

A small plastic suction tube may be placed in the femoral canal to allow air and blood to escape while the cement is being inserted and to reduce the hydrostatic pressure. Have the femoral component immediately available for insertion. Determine the desired amount of anteversion and the medial/lateral position of the stem before insertion. Hold the stem by the head and insert it manually at first. Insert the tip of the stem within the centre of the cement mantle. Use firm even pressure to insert the stem. Have a plastic-tipped head impactor and a mallet immediately available to complete the seating of the stem. Remove the cement from the region of the collar to be certain that the stem has been fully inserted and, if not, impact it further.

Maintain firm pressure on the head of the component as the cement hardens. As the cement enters a doughy phase, cut the cement around the edges of the prosthesis and carefully remove it from the operative field. Do not pull the cement from beneath the component or proximal support may be lost. Carefully inspect the anterior aspect of the femoral neck to be sure no cement protrudes where it may cause impingement and dislocation. Recheck the positioning and the stability of the femoral component. If there is any detectable motion or if fluid extrudes in the bone-cement interface with movement, then it is unstable and must be replaced. If it appears satisfactory, then reduce the hip and check the stability of the hemiarthroplasty.

After reduction of the hip, proceed with repair of the posterior soft tissue envelope. If the capsule has been preserved, then repair it with heavy non absorbable sutures. Reattach the previously tagged tendons of short external rotators to the posterior aspect of the greater trochanter careful reconstruction of the posterior soft tissue envelope may help stabilize the hip postoperatively. Insert 2 closed suction drainage tubes, one deep to the fascia lata and the other in the subcutaneous plane and bring them out through separate stab wounds. Abduct the hip 10 degrees while closing the fascial incision with closely approximated sutures. Close the subcutaneous layer with interrupted absorbable sutures. Close the skin in routine fashion.

COMPLICATIONS

- Some complications are inherent to any major surgical procedure
- In elderly individuals. Others are specifically related to the procedure.

NERVE INJURIES[15]

Sciatic Nerve

- Commonest injured nerve. Subclinical injury is the rule rather than an exception.
- Injudicious retraction may cause stretch injury or direct contusion.
- Injured during lengthening of 4 to 5 cms.
- In Subgluteal hematoma, pain, tense swelling and tenderness are also seen. Early diagnosis and prompt surgical decompression are imperative along with reversal of anticoagulants.
- Dislocation in the postoperative period
- The status of the sciatic nerve should always be documented before the surgery.

Treatment of sciatic nerve injury:

- Foot support to prevent fixed equinus deformity.
- Partial functions usually return. Exploration of the sciatic nerve is considered if some recovery is not present in 6 weeks, or if a mass of cement or a transacetabular screw is suspected to be pressing on the nerve.

- Reflex sympathetic dystrophy secondary to incomplete sciatic nerve injury may require sympathetic blocks or sympathectomy

Peroneal Nerve

- Injured during lengthening of 2 to 3.5 cms
- Intra or post operative positioning - due to direct pressure

Femoral Nerve

- Lies near the anterior capsule and is separated from it by the iliopsoas.
- It is rarely injured by retraction anterior to iliopsoas, anterior capsulectomy and by extruded cement if pressurised.

VASCULAR INJURIES

Rare but can lead to loss of whole limb. Vascular injuries may be caused by the following acute intra operative events.[15]

1. Use of retractors: Never place sharp pointed retractors blindly. When using them adjacent to acetabulum, position them against bone.
2. Use careful technique to avoid direct injury to vessels by osteotomies,

THROMBOEMBOLISM

This is the most common serious complication following hemiarthroplasty leading to even death within 3 months post op. It usually in the vessels of the thigh and calf in the 1st to 3 weeks after.

Clinical diagnosis is by eliciting pain and tenderness in calf and positive Homan's sign, unilateral swelling and erythema of the low grade fever and rapid pulse. Pulmonary embolism is diagnosed on basis of chest pain (especially if pleuritic in nature) ECG, CXR and arterial blood gas analysis.

Tests for DVT include venography, B-mode ultrasonography, impedance plethysmography, radioactive iodine - labelled fibrinogen and pulmonary angiography.

Prophylaxis of DVT:

- Non pharmacologic modalities include Early mobilisation, elastic stockings etc.
- Pharmacologic modalities include Agents such as Aspirin, Low dose Heparin, Adjusted dose Heparin, Dextran and Warfarin.

DISLOCATION

Some surgeons claim to have virtually no dislocations after hemiarthroplasty. Others are concerned about the frequency of this implication, which is distressing to the patient and their careers. The dislocation rate varies with different authors.

Whilst there is some argument about the merits and demerits of the various approaches, it would appear from, various studies, that the use of posterior approach bounds a much greater risk of dislocation (5.8 % at the

Mayo Clinic, according to Woo & Morrey) than do anterior approaches (2.3 % at the same Clinic).[16]

The posterior approach has a number of advantages that tend to outweight the dislocation risk. However that is a different subject altogether. We used posterior approach in all cases.

If one considers Charnley devices inserted at different centers by different senior surgeon same in the same techniques, using the same approach, the dislocation rate will be seen to vary within a wide range, from less that 1 % to very high rates that had made the surgeons concerned abandon the conventional socket.

Classification of Dislocation:

There are 3 ways in which dislocation may be classified: -

(A) In terms of the event(s) precipitating the dislocation

<u>Spontaneous Dislocation or True dislocation</u> - occurs following an ordinary activity of daily living, such as getting up from a low seat or out of car, etc. fracture neck of femur.

<u>Traumatic Dislocation</u> - follows a violent blow to the hip. If the patients in studies with long follow up, there will always be cases of traumatic dislocation, unless they are deliberately excluded from the analysis. Traumatic dislocations must, however, be specified in any study of post total hip replacement dislocation.

(B) In terms of aetiology

P. Fontes, I. Benoit, A. Lortat-Iacob and R.Didry have devised a system that may be usefully applied for the classification of dislocations under this heading.[16]

- Following faulty implant placement - less often because of faulty placement of femoral component.
- As a result of loss of joint constraint - because of the weakening of the periarticular muscles (mainly gluteus medius, but also the short external rotators) compounding the effect of the excision of the capsule. Weakness of the gluteus medius does not necessarily signify wasting of the muscle, but a new and different pattern of muscle function, permitting loss of joint constraint in flexion.

Faulty placement and loss of joint constraint will often be found to occur together.

(C) In terms of time to dislocate

Using the system proposed by I.P. Daly and B.F. Morrey, we may distinguish among 3 time frames:-

Early dislocation - occurring within 3 months following arthroplasty. This is by far the most frequent form of dislocation. These dislocations are generally due to faulty implant placement, and favoured by postoperative soft tissue relaxation. Overall, 75% of all dislocations are early ones.

Unless the investigation of the patient yields evidence of major component malposition, these dislocations may be treated, with good prospects of success, by closed reduction and immobilization.

Secondary Dislocation - occurring between 4 months and 5 years from arthroplasty. These dislocations are often caused by malposition of the stem or by abnormalities of the abductors(10% of all dislocations).

Investigations should be directed towards detecting component malposition. Management consists in the correction of implant position to prevent an otherwise very probable recurring dislocation.

Late Dislocation - at 5 years and beyond. Late dislocation rates vary greatly with different studies. These are most probably as a result of progressive stretching of the pseudo capsule, brought on by the inflammation caused by particulate debris.

Established Treatment:

Dislocations may be managed conservatively, by simple closed reduction Surgically.

(A) Closed Reduction - followed by a few weeks of immobilization is justified in early dislocations. On an average, the reduced hip will remain stable in 72.5% of the cases. The rate found by Ali Khan[17]was 81%, Woo & Morrey[16] observed 65%. A dislocation which recurs once will recur again in 77% of the cases. Usually recurrence is due to major implant malposition, which will need to be corrected surgically. External immobilization after reduction does not statistically reduce the likelihood of recurrence.

(B) Surgical reduction - if need be with a correction of component (usually cup) placement, and sometimes involving tensioning of the gluteal muscles. There is a high risk of recurrence, since stability is obtained in 68.6% of the cases on an average. The following figures have been found in literature.[16] Fraser & Wroblewski 76%; Woo & Morrey(1982) 69% and Daly & Morrey (1992) 61%. It should, however, be borne in mind that the statistical results of closed and of surgical reduction cannot be compared with each other, since the 2 techniques would be used to treat different types of patients, with surgical reduction more often resorted to for the management of recurrent dislocation.

LIMB LENGTH DISCREPANCY

Equal limb lengths should be achieved, but it is usually not possible. More importance is given to relief of pain, increased mobility and stability. Muller noted that the center of head of femoral component should be to the level of the upper edge of the greater trochanter on X-ray evaluation.

HETEROTOPIC OSSIFICATION

Seen commonly in males with ankylosing spondylitis, fused hip, hypertrophic osteoarthritis or post traumatic arthritis, where considerable bone is resected along with extensive soft tissue dissection.

Classification of Brooker et al[18]

1. Islands of bone within soft tissue
2. Bone spurs from proximal femur with at least 1 cm between opposing bone surfaces
3. Bone spurs from proximal femur or pelvis with less than 1cm between opposing bone surfaces.
4. Ankylosis.

Histologically similar to myositis ossificans. Loss of motion is the predominant functional limitation.

Prophylaxis within 3 days of surgery with

1. Low dose radiation (single dose of 600 -700 rad)
2. Indomethacin 75mg/day for 6 weeks
3. Bisphosphonates

ASEPTIC LOOSENING[15]

Aseptic loosening of hemiarthroplasty is one of the most important long term complications of hemiarthroplasty, and is one of the commonest indications for revision surgeries.

There are various factors which operate together and produce aseptic loosening. These include

1. Mechanical factors
2. Technical Factors
3. Biological and Host factors

Mechanical Factors

As a result of chronic mechanical overload, micro motion and micro fractures develop within the cement and subchondral bone. It may also break the bond between the cement and the bone, thus leading on to resorption of the bone, with production of radiolucent lines and progressive aseptic loosening.

Mechanism of stem loosening

Mode I - Pistoning behavior

Mode II - Medial stem pivot

Mode III - Calcar pivot

Mode IV - Cantilever bending

Various causes that contribute to the mechanical overload are

- Increased weight of the patient.
- Increased post surgical activity.
- Relatively young patient
- Faulty position of femoral components, thus altering the biomechanics of the hip, resulting in increased stresses passing through this artificial joint.

Technical Factors

There are various technical factors which enhance the mechanical cause of aseptic loosening.

- Inadequate encapsulation of the prosthesis by the cement.

- Failure to insert the cement before it becomes viscous or doughy, so that it does not flow adequately into the interstices of the bone.
- Failure to prevent stem motion while the cement is hardening
- Inadequate pressurization of the cement and hence the cement does not enter the cancellous bone properly.
- Voids in the cement because of not mixing the cement properly, so that an excess number of air bubbles are included in it, or allowing blood to be mixed in the cement.
- In the uncemented group the causes are improper size if prosthesis used, improper reaming with oversized broaches and loosing the cancellous bone mantle thickness.

Biological and Host Factors

Minute particles of debris are liberated from the various components of the arthroplasty due to wear and tear. These debris interact with the macrophage monocyte system and induce a foreign body granulomatous reaction. This results in the release of soluble inflammatory mediators which act directly on the connective tissue and lyse them, thus producing peri-implant osteolysis.

All these factors interact with each other and cause aseptic loosening. However, it can be said that the Mechanical and Technical factors play a role in the causation of aseptic loosening of the cemented femoral components. Biological factors play an important role in the causation of aseptic loosening of the cemented acetabular component and non cemented total hip arthroplasties.

OSTEOLYSIS

The mechanism of production of osteolysis

The generation of wear particles ->The access of these particles to the periprosthetic bone thorugh the joint fluid -> the cellular response to the particulate debris (IL-6, IL-1, TNF are associated with focal osteolysis)

STEM FAILURE

Deformation and fracture of the stem occurring response to cyclic loading and usually develop several years after hemiarthroplasty surgery

1. Excessive weight in large men with degenerative arthritis
2. Increased physical activity
3. Varus position of stem
4. Femoral component with a long neck or increased offset
5. Inadequate support of the proximal part of the stem by cement or bone

PERIPROSTHETIC FRACTURES

Intra operative

The risk factors

- Sustained degree of preoperative bone loss
- Low femoral cortex to canal ratio
- Under reaming of cortex
- Large stems

Post Operative

- Stress fractures caused by increased use of the limb after surgery.
- Fractures caused by stress risers in the femoral shaft including cortical defects and inadequate cement distal to the tip of the prosthesis
- Fractures caused by trauma violent enough to fracture a normal limb

INFECTIONS

Post operative infections of hemiarthroplasty are usually Catastrophic requiring removal of both components and the cement, and it is associated with a high rate of morbidity and mortality. Difficulty in eradication of infection is due to the growth of bacteria in the bio film on the biomaterials as reported by Gristina.

Treatment includes

1. Antibiotic therapy
2. Incision and drainage of the hip
3. Debridement and modified Girdlestone resection arthroplasty
4. One or Two stage Total hip arthroplasty
5. Hip disarticulation as a last resort of life saving procedure.

Hip arthrodesis ideal for young patient with unilateral disease but very difficult due to lack of adequate bone stock.

In acute post op infections which are usually superficial Appropriate antibiotic therapy, incision and drainage with intermittent Antibiotic irrigation and suction drainage should be the preferred modality of treatment.

In deep delayed infections, which may be active or indolent and low grade,X-rays should be reviewed for joint loosening. Diagnosis may be confirmed by aspiration of the Joint.

If loosening is present, components and cement should be removed and a modified Girdlestone procedure done. If there is no evidence of loosening at the time of surgery, they may be left in place in the hope of salvaging the hip. The wound should not be sutured but left open. Non absorbable sutures approximating skin, and passing deep to the facia may be applied. Parenteral antibiotics for 4-6 weeks and oral antibiotics for 4-6 months should be given.

In late hematogenous infections, the treatment is the same as above.

CLINICAL EVALUATION:

Clinical evaluation is done based on Harris Hip Score.

Harris Hip Score[15]

Pain (44 points)

a) None or ignores it	-	44
b) Slight, occasional	-	40
c) Mild pain, no effect on average activities	-	30
d) Moderate pain, tolerable but makes concessions to pain	-	20
e) Marked pain, serious limitation of activities	-	10
f) Totally disabled, crippled, pain in bed	-	0

Function (47 points)

A. Gait (33 points)

1. Limp

a. None	-	11
b. Slight	-	8
c. Moderate	-	5
d. Severe	-	0

2. Support

a. None	-	11
b. Cane for long walks	-	7
c. Cane most of time	-	5
d. One crutch	-	3

e. Two canes - 2

f. Two crutches - 0

g. Not able to walk - 0

3. Walking distance

a. Unlimited - 11

b. 6 blocks - 8

c. 2-3 blocks - 5

d. Indoors - 2

e. Unable to walk - 0

B. Activities (14 Possible)

1. Stairs

a. Normally without using railing - 4

b. Normally using a railing - 2

c. In any manner - 1

d. Unable to do stairs - 0

2. Shoes and socks

a. With ease - 4

b. With difficulty - 2

c. Unable - 0

3. Sitting

a. Comfortably in chair one hr - 5

b. On a high chair for one half hr - 3

c. Unable to sit comfortably in chair - 0

d. Enter public transportation - 1

Absence of deformity points - (4) are given:

a. Less than 30 deg fixed flexion contracture

b. Less than 10 deg fixed adduction

c. Less than 10 deg fixed internal rotation in extension

d. Limb length discrepancy less than 3.2cm

IV. Range of movements (5 possible)

Total degree measurements, then check range to obtain score.

221°	-	300°	(5)
161°	-	210°	(4)
101°	-	160°	(3)
61°	-	100°	(2)
31°	-	60°	(1)

Score

100-90	Excellent
89 - 80	Good
79-70	Fair
Below 69	Poor

RADIOLOGICAL EVALUATION

Observations and measurements were made on the anteroposterior radiograph of the pelvis and on the anteroposterior and lateral radiograph of the hip during immediate post op, 6 weeks and then every 6 months follow up.

Radiographic evaluation included

1. Loosening of femoral components.
2. Femoral stem position
3. Vertical subsidence
4. Heterotopic Ossification

1. LOOSENING OF THE FEMORAL COMPONENT

Uncemented femoral component

Engh's criteria (Clinica Orthop 1990 – 257)

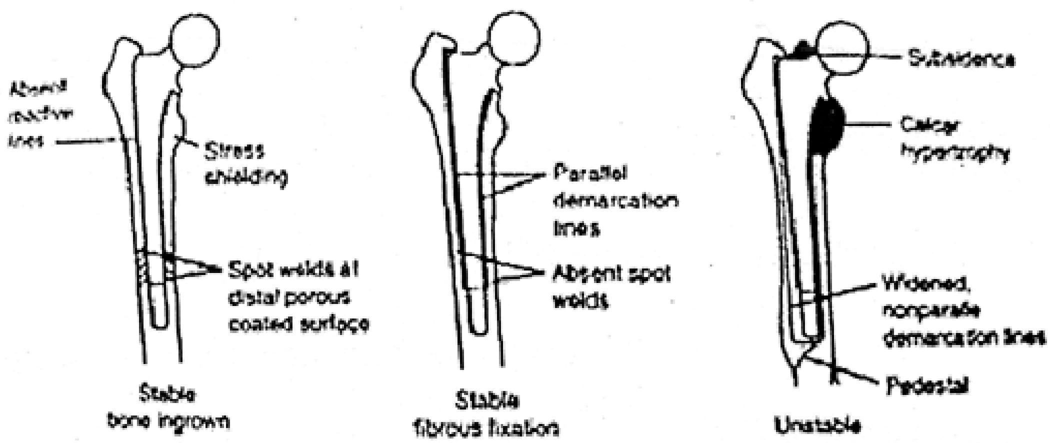


Fig 14. Engh's criteria

1. Stable bone ingrown

- Absent reactive lines Stress shielding
- Spot welds at distal porous coated surface

2. Stable fibrous fixation

- Parallel demarcation lines absent spot welds

3. Unstable

- Subsidence
- Calcar hypertrophy
- Widened nonparallel demarcation line
- Pedestal

Cemented femoral component[15]

Gruenzone criteria (clinic ortho1979).According to Gruen loosening is defined as radiological interpretation of change of mechanical integrity of the load carrying femoral component specifically.

- Fractured acrylic cement.
- Interface gap between stem-cement and cement-bone interface of more than 2mm in width.
- Gross movement of the femoral component.
- Stem fracture

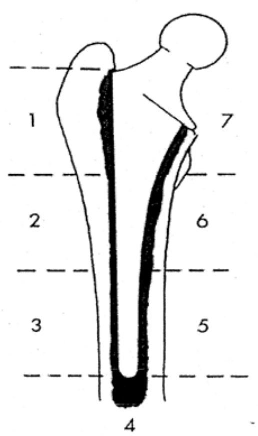


Fig 15. Gruen zones

2. FEMORAL STEM POSITION

To determine whether there had been any varus or valgus displacement of the femoral component, the mid points of the transverse diameters of the stem of the prosthesis and of the femoral shaft at levels of one, three and five centimeters proximal to the tip of the stem were established on the AP radiographs. The mid points of these diameters were then used as reference points to draw two lines. The angles between lines were used to measure any varus or valgus angulation, of the femoral component relative to the axis of the femoral shaft.[19]

Femoral stem position was noted as

1. Central
2. Valgus
3. Varus

Varus Centre Valgus

Fig 16. Engh's criteria

3. VERTICAL SUBSIDENCE[15]

Vertical subsidence of the femoral component was measured by determination of the change in the distance from the superomedial extent of the porous coating to the most proximal point on the lesser trochanter. Subsidence was further checked by measurement of the distance from the tip of greater trochanter to the superolateral border of the femoral component and examination for a superior lucency in the bone there. A decrease of 5mm or more in the vertical position was considered to indicate subsidence

4. HETEROTOPIC OSSIFICATION

Heterotopic bone when present was graded according to the classification of Brooker et al.[18]

Brooker's classification

I - Islands of ossification

II - Bone spurs from the proximal femur or pelvis with at least 1 cm between opposing bone surfaces.

III - < 1 cm

IV - Ankylosis

Materials & Methods...

MATERIALS AND METHODS

Study Design: Comparative study

Study Settings: Orthopaedics outpatients and inpatients in Sree Mookambika Institute of Medical Sciences, Kulasekharam.

Duration of the Study: 18 months (December 2015 to April 2017)

Total number of groups: 2

Detailed description of the study groups:

- First group - Unipolar Hemiarthroplasty
- Second group - Undergoing Bipolar Hemiarthroplasty.

SAMPLING

a. **Sample size of each group:** 20

b. **Total sample size of the study: 40**

c. **Scientific basis of sample size used in the study:**

$$\text{Sample size (n)} = \left\{ (Z_1\sqrt{2\,p(1-p)} + Z_2\sqrt{[p_1(1-p_1)+p_2(1-p_2)}\right\}^2$$

Z_1= Z value associated with set of alpha = 1.64 [fixed]

P_1= probability of outcome in unipolar = 79.79

P_2= probability of outcome in bipolar = 86.18

$P = \frac{P_1+P_2}{2} = 0.82$

Sample size =19.5 = 20

So, sample size for unipolar =20 and Sample size for bipolar =20

d. Sampling technique: Convenient sampling

Inclusion criteria:

1 Displaced intracapsular fracture of the neck of the femur with adequate calcar.
2. Male and female patients of age 60 years and above
3. Neglected intracapsular fractures of the neck of the neck femur more than 3-4 weeks old in elderly patients.
4. Non-union of intracapsular fractures of the neck of femur in elderly patients.
5. Unilateral fracture neck of femur.

Exclusion criteria:

1. Fracture of the neck of the femur in younger patients.
2. Extra capsular fractures of the neck of femur
3. Patient with neurological disorders
4. Any other, patients associated with any other ipsilateral or contralateral fracture of upper and lower extremities
5. Pathological fracture neck of femur.
6. Fracture neck of femur with shaft of femur fracture.
7. Bilateral fracture neck of femur.

Table 2. Comparison between Unipolar and bipolar prosthesis

	Unipolar	**Bipolar**
Total No. of Patients	20	20
Total No. of Hips	20	20
Age	64 to 82 years (mean 69.45 years)	65 to 88 years (mean 74.6 years)
Cemented / Uncemented	Cemented = 10 Un cemented = 10	Cemented = 10 Un cemented = 10
Right/Left	Left =11 Right =9	Left =12 Right =8
Approach	Posterior	Posterior
Unilateral / Bilateral	20/0	20/0
Study	Retrospective and Prospective	Retrospective and Prospective
Follow up	12 to 85 months (Mean follow up – 48.2 months)	12 to 84 months (Mean follow up – 46.2 months)

UNIPOLAR HEMIARTHROPLASTY:

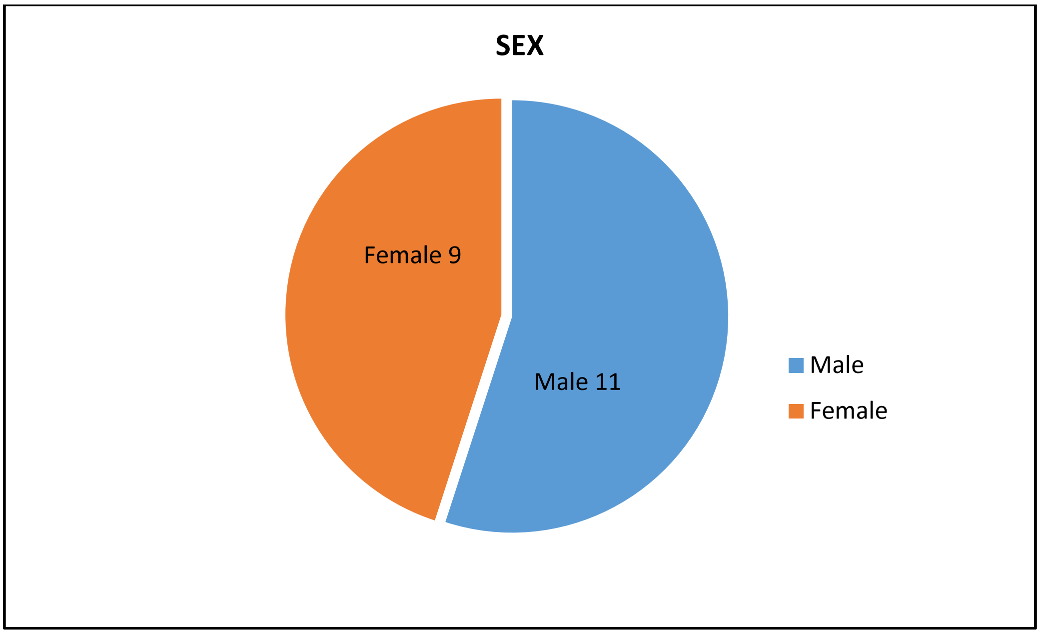


Fig 17. Comparison of gender in Unipolar cases

BIPOLAR HEMIARTHROPLASTY:

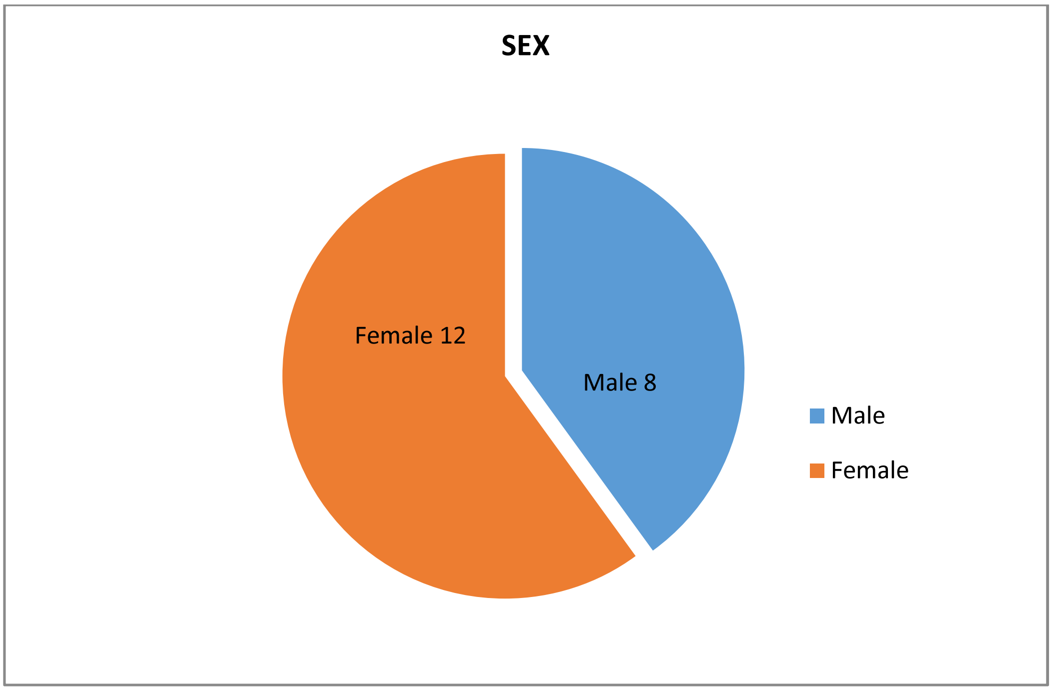


Fig 18. Comparison of gender in Bipolar cases

UNIPOLAR HEMIARTHROPLASTY:

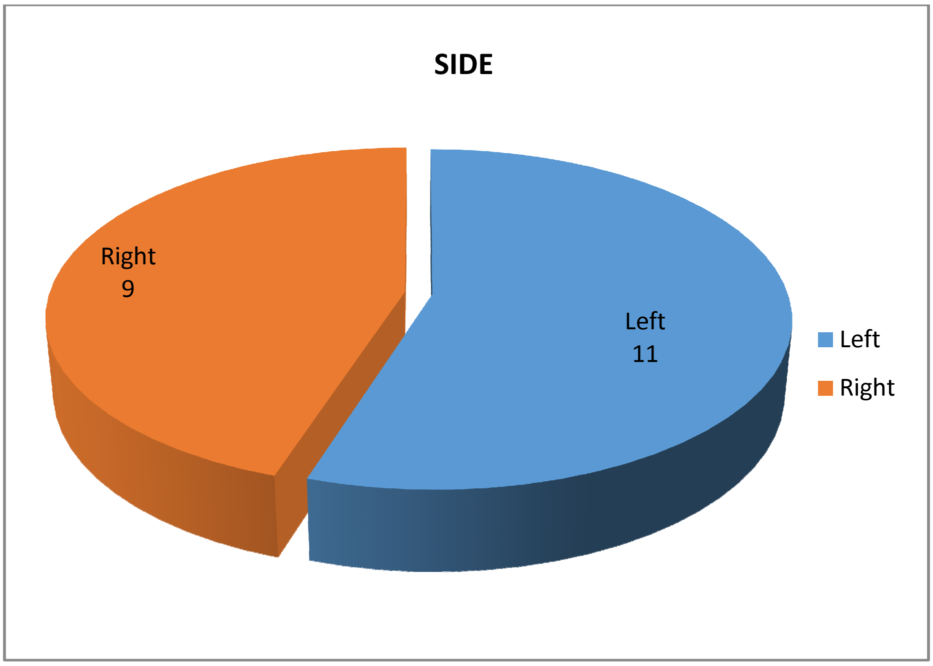


Fig 19. Comparison of operated side in Unipolar cases

BIPOLAR HEMIARTHROPLASTY:

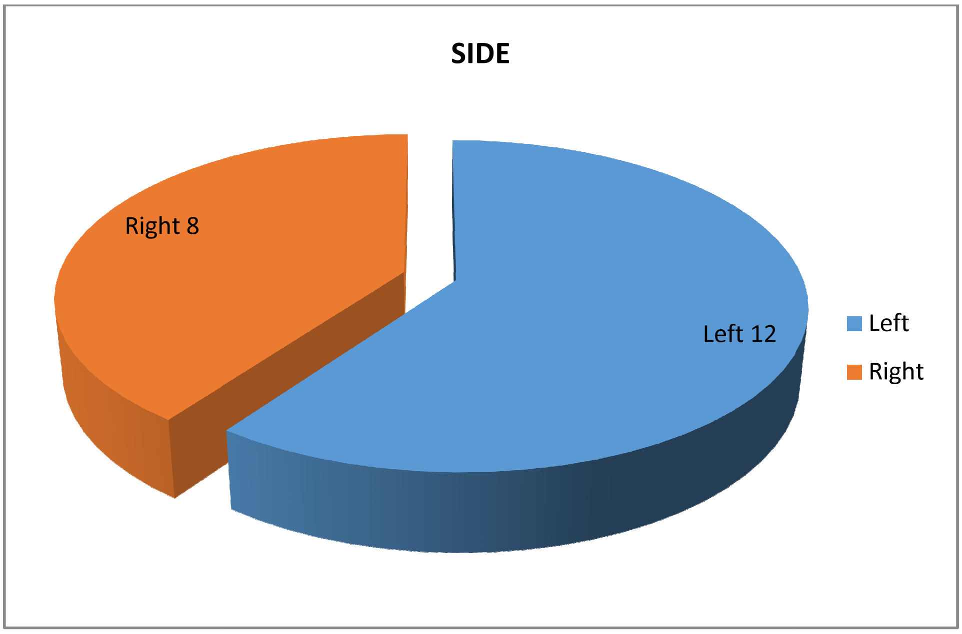


Fig 20. Comparison of operated side in Bipolar cases

UNIPOLAR HEMIARTHROPLASTY:

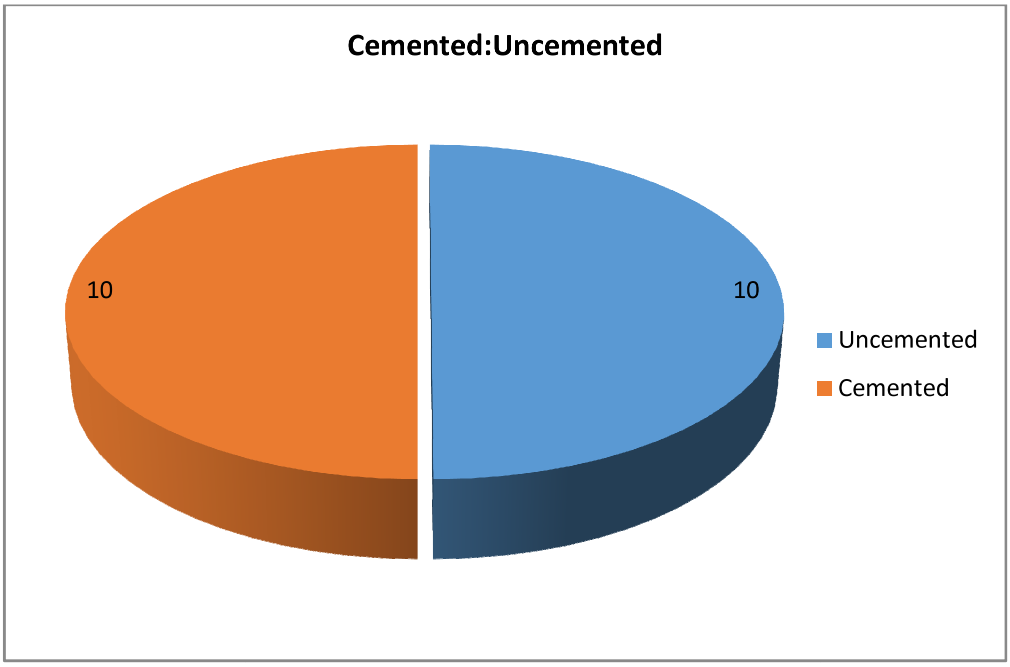


Fig 21. Comparison of Cemented and Uncemented in Unipolar cases

BIPOLAR HEMIARTHROPLASTY:

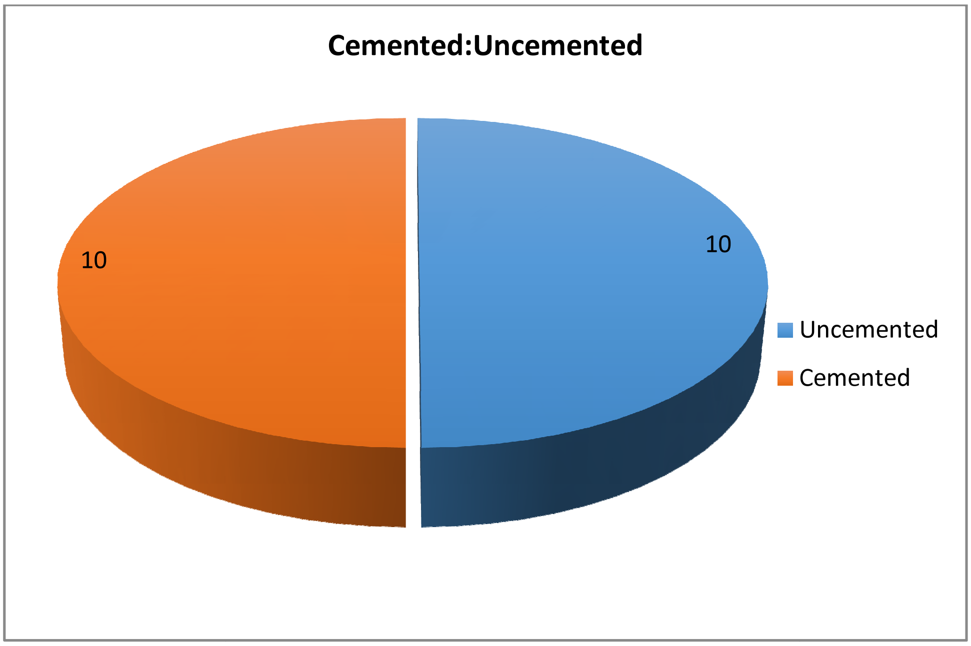
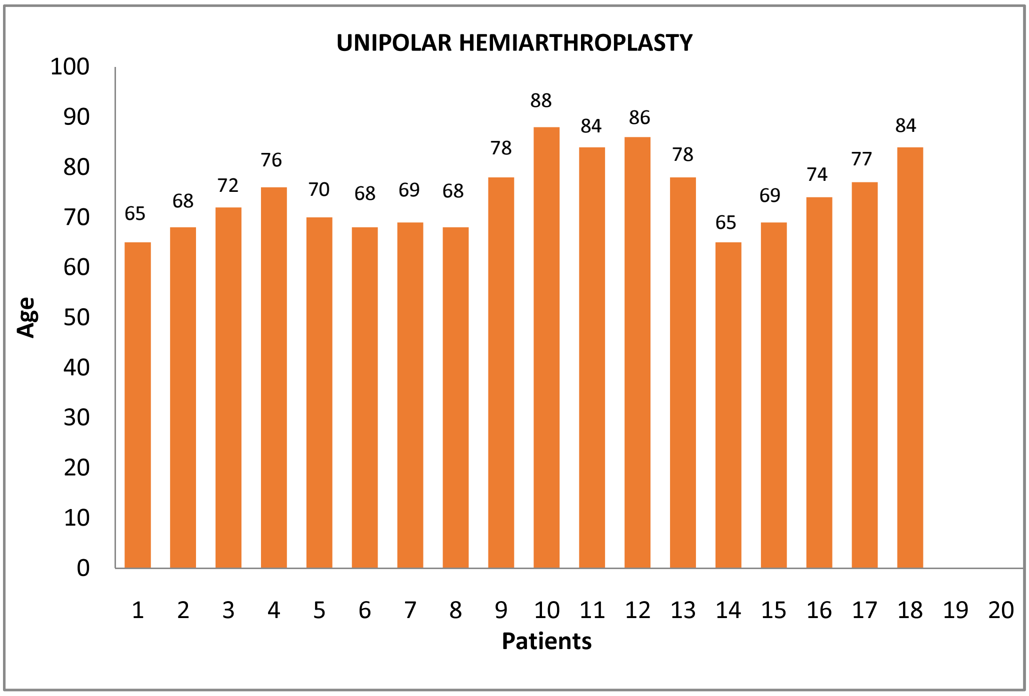


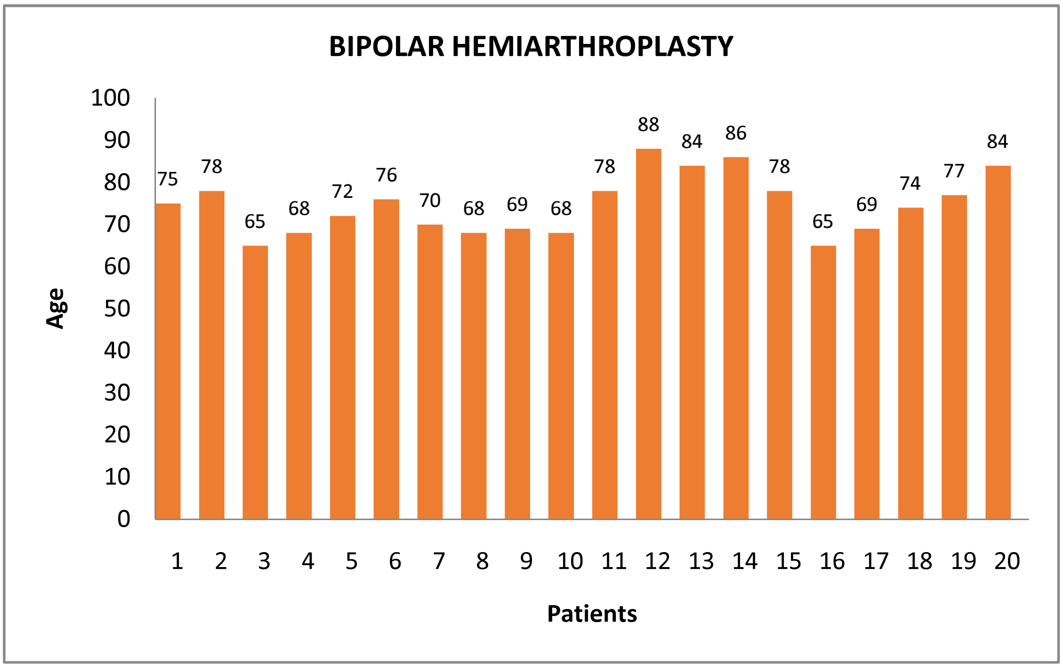
Fig 22. Comparison of Cemented and Uncemented in Bipolar cases

AGE DISTRIBUTION



Mean Age – 69.45 Years, Youngest : 63 Years Oldest : 82 Years

Fig 23. Distribution of Unipolar cases based on Age



Mean Age – 74.6 Years, Youngest : 65 Years Oldest : 88 Years

Fig 24. Distribution of Biipolar cases based on Age

UNIPOLAR HEMIARTHROPLASTY:-

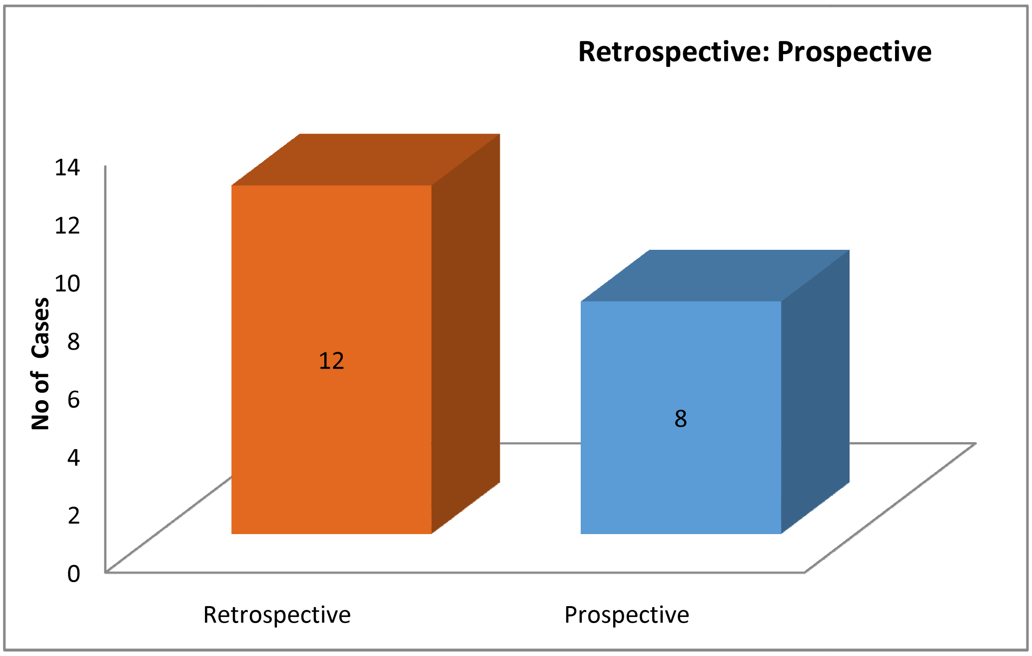


Fig 25. Distribution of Unipolar cases based on Retrospective and prospective

BIPOLAR HEMIARTHROPLASTY:-

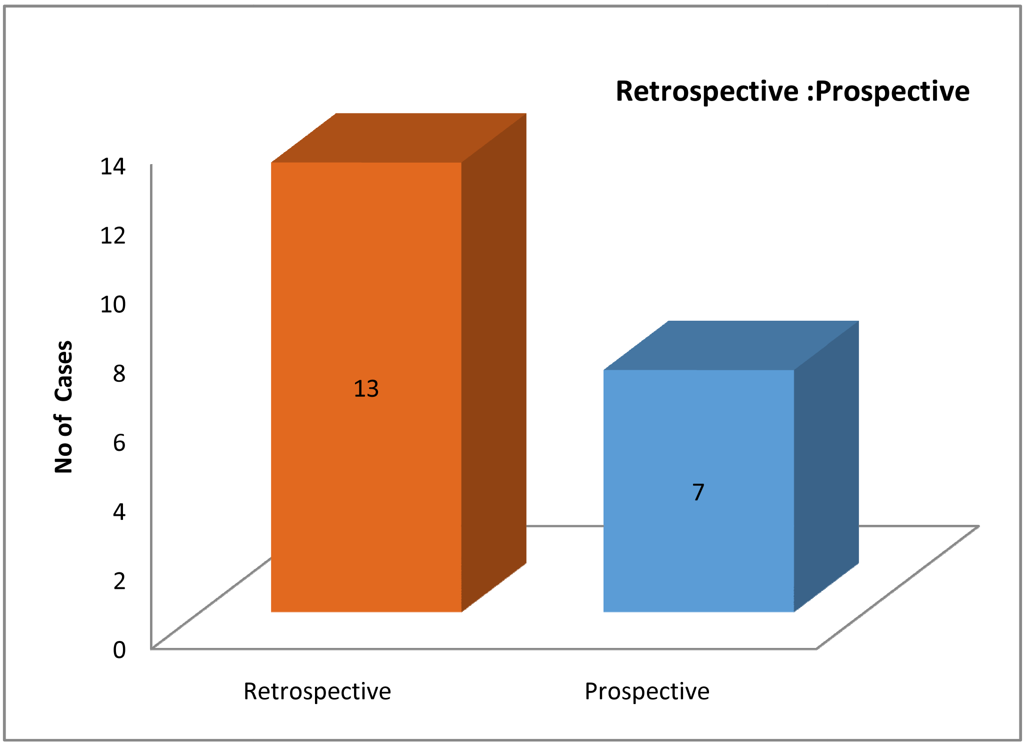


Fig 26. Distribution of Biipolar cases based on Retrospective and prospective

PREOPERATIVE EVALUATION

Clinical

Preoperatively the patients were evaluated using the Harris hip score. This score takes into account pain, function, absence of deformity and range of motions. The general condition of the patient including his physical and mental status, general medical condition and ability to withstand surgery is considered. Physical status should include both upper and lower extremities including opposite hip, both knees, feet and spine. Any fixed deformities and limb length discrepancy was noted. Trendelenberg test to access the abductor Osseomuscular mechanism was noted.

Investigations

The complete blood count, ASO, ESR, CRP, urine analysis, chest x-ray and multi channel ECG were done as a routine.

Preoperative radiographic assessment

- X ray Pelvis with both hips AP view
- X ray of affected hip AP and Lateral view

Preoperative planning includes templating the x-rays. Goals of preoperative planning are

1. To determine the correct site, size and implant (uncemented/ cemented).
2. To restore the anatomic and biomechanical center of rotation of the hip joint.
3. To restore any limb length discrepancy
4. To restore appropriate muscle relationships.

OUR SURGICAL PROCEDURE

Preparation of Patient

On the day of surgery, skin is prepared using povidone-iodine solution and covered with sterile drapes and brought to the theatre where a final preparation is done. Prophylactic antibiotic is given on the table. We prefer third generation cephalosporin in the dose of 1 gm given IV along with an Aminoglycoside for 72 hours.

Operation theatre:

Though many hemiarthroplasties are being done in theatres with laminar flow, using body exhaust systems to reduce exogenous bacterial contamination even now, it is possible to achieve a comparable rate of infection in a conventional operating theatre if adequate precautions are taken to maintain asepsis such as thorough fumigation, air-conditioning, limiting the flow of traffic through the theatre to essential personnel only, use of prophylactic antibiotics, maximal operative speed and minimal conversation.

Fig 27. Instruments used for Hemiarthroplasty

Anaesthesia used, positioning and approach:

Epidural/spinal/ general anesthesia was usually employed. The patient is then positioned in lateral since we use posterior approach. In our study all the patients were operated through posterior approach.[15]

In this approach the patient is placed in the true lateral position with the affected limb uppermost. We make a 10 to 15 cm curved incision on the posterior aspect of the greater trochanter. We incise the fascialatae on the lateral aspect of the femur to uncover the vastus lateralis. We lengthen the fascial aspect of the femur to uncover the vastus lateralis.

We lengthen the fascial incision superiorly in line with the skin incision and split the fibers of the gluteus maximus by blunt dissection. We internally rotate the hip to put short external rotator muscles on a stretch and to pull the operative field away from the sciatic nerve.

We do not go and look for the sciatic nerve, but if it is noticed in our procedure utmost care is taken not to injure it. We detach the muscles close to their femoral insertion and reflect them backward. The posterior aspect of the hip joint capsule is now fully exposed.

The hip joint capsule is incised with a T-shaped fashion. We achieve dislocation of hip by internal rotation, flexion and adduction. Now we remove the femoral head with fractured neck, and excellent exposure of the acetabulum is obtained. As a routine, swabs were taken both from acetabular and femoral side and all our cultures were negative.

Implantation of Cemented Femoral Component

We do cement fixation in patients with a physiologic age greater than 65 years and when the femoral cortex is thin or osteoporotic and a secure press-fit fixation is unlikely. Then we insert the broaches in approximately 15 degrees of anteversion in relation to the axis of the knee. We maintain correct axial alignment as the broach is inserted. Alternately we impact and extract the broach to facilitate its passage. Because fixation will be achieved with cement, the requirements for absolute stability of the broach are not rigorous as with cementless techniques. If resistance is felt during insertion of the broach, then the area of impingement is most likely distally within the diaphysis. Then we broach to prepare cortical bone in the diaphysis. We do not attempt to impact the broach further because a femoral fracture may occur or the broach may become incarcerated.

Now we carry out a trial reduction to determine the limb length with the prosthesis without cement. Since the stem is to be fixed with cement, the depth of insertion of the component is predetermined at this point. Then we finally select component sizes and limb length and stability have been assessed, to dislocate the hip and remove the trial implant. Then we remove remaining loose cancellous bone from the medial aspect of the proximal femur using straight and angled curettes. Then we do not touch the stem or allow contamination with blood or debris, because this may compromise the cement-implant interface after implantation. Now we change outer gloves and begin preparation of cement.

Then we mix 2 packages of cement for a standard size femoral stem. The cement is moulded into the shape of a sausage and is held in the palm of one hand or in an open plastic container. A medullary plug is not used, for it will trap air and blood in the distal end of the canal. The cement is pushed into the canal with the index finger or thumb of the opposite hand. It is pushed as far distally as the finger will reach. We take care to avoid mixing blood with cement and to keep the bolus of cement intact. After the cavity has been filled, the cement is pressed with the thumb. A mechanical impactor or plunger may be used. A small plastic suction tube may be placed in the femoral canal to allow air and blood to escape while the cement is being inserted and to reduce the hydrostatic pressure. Have the femoral component immediately available for insertion. Determine the desired amount of anteversion and the medial/lateral position of the stem before insertion. Hold the stem by the head and insert it manually at first. Insert the tip of the stem within the centre of the cement mantle. Use firm even pressure to insert the stem. Have a plastic-tipped head impactor and a mallet immediately available to complete the seating of the stem. Remove the cement from the region of the collar to be certain that the stem has been fully inserted and, if not, impact it further. Maintain firm pressure on the head of the component as the cement hardens. As the cement enters a doughy phase, cut the cement around the edges of the prosthesis and carefully remove it from the operative field. Do not pull the cement from beneath the component or proximal support may be lost. Carefully inspect the anterior aspect of the femoral neck to be sure no cement protrudes where it may cause impingement and dislocation. Recheck the positioning and the stability of the femoral component. If there is any detectable motion or if fluid extrudes in the bone-cement interface with movement, then it is unstable and must be replaced. If it appears satisfactory, then reduce the hip and check the stability of the hemiarthroplasty.

Thompson Unipolar Prostheses

Cemented Bipolar Prostheses

Austin Moore

Uncemented bipolar

Fig 28. Types of Prosthesis

Implantation of cementless (uncemented) femoral component

We insert the reamer at a point corresponding to the piriformis fossa. The insertion point is slightly posterior and lateral on the cut surface of the femoral neck. An aberrant insertion point will not allow access to the center of the medullary canal. Then we, after the point of the reamer has been inserted, direct the handle laterally towards the greater trochanter. We aim the reamer down the femur towards the medial femoral condyle. If this cannot be accomplished, we remove additional bone from the medial aspect of the greater trochanter, or varus positioning of the femoral component will result. We use rongeur, a box chisel, or a specialised trochanteric reamer for this purpose. Generally, a groove must be made in the medial aspect of the greater trochanter to allow proper axial reaming of the canal. We insert the reamer to a predetermined point.

We determine the proper depth of insertion of the reamer. We assess the stability of the axial reamer within the canal. No deflection of the tip of the reamer in any plane should be possible. No we proceed with preparation of the proximal portion of the femur. We removed the residual cancellous bone along the medial aspect of the neck with broaches. Then we place the broach precisely as the axial reamers. We rotate the broach to control anteversion. We seat it final to a point where it becomes axially stable within the canal and will not advance further.

We perform this manoeuvre after full muscular relaxation has been obtained. We irrigate any debris out of the acetabulum. Then we insert the appropriate size femoral component. We insert the stem to within a few centimetres of complete seating by hand. We should be certain to reproduce the precise degree of anteversion determined by the driving device provided with the system or a plastic tipped pusher. We use blow of equal force as the component is seated. As the component nears complete seating, it will advance in smaller increments with each blow of the mallet. An audible change in pitch usually can be detected as the stem nears final seating. We removed any debris from the acetabulum and again reduce the hip. We make sure that no soft tissues have been reduced into the joint. Then we confirm the stability of the hemiarthroplasty through a full range of motion.

After reduction of the hip in both the cemented and uncemented hemiarthroplasties, we proceed with repair of the posterior soft tissue envelope. If the capsule has been preserved, then repair it with heavy non absorbable sutures. Reattach the previously tagged tendons of short external rotators to the posterior aspect of the greater trochanter careful reconstruction of the posterior soft tissue envelope may help stabilize the hip postoperatively. Insert 2 closed suction drainage tubes, one deep to the fascia lata and the other in the subcutaneous plane and bring them out through separate stab wounds. Abduct the hip 10 degrees while closing the fascial incision with closely approximated sutures. Close the subcutaneous layer with interrupted absorbable sutures. Close the skin in routine fashion.

POSTOPERATIVE CARE AND REHABILITATION

Antibiotics

The patient is given fifth generation intravenous cephalosporin for the first 5 days.

Post operative care

The patient is nursed in absolute aseptic conditions in the postoperative ward with the limb protected by an abduction pillow placed between the legs and a small pad beneath the knee to maintain it in slight flexion. Drains are removed at the end of 48 hrs. Drain tips are sent for microbiological examination.

Rehabilitation protocol

This actually begins preoperatively where the exercises to be practiced are taught by the physiotherapist. These exercises i.e. ankle dorsiflexion and plantar flexion, Quadriceps and gluteal exercises are started as soon as pain subsides. Upper limb and breathing exercises are also done. Patients are allowed to sit in bed in the first post op day. After drain removal patient is made to stand and walk. Sutures are removed on 10th day and patient is advised 6 weeks of bed reset.

Adduction is dangerous and coupled with flexion and internal rotation, is ever more so. The patient is instructed to avoid these positions. The patient is instructed not to squat, sit cross legged and is to adapt a table and chair life style.

After the surgery clinical evaluation with Harris hip score(Modified) (Campbell) and radiological evaluation with plain x-ray pelvis both hips and proximal femur - AP view was done for all patients at regular intervals.

FOLLOW UP

Prospective patients were reviewed regularly at 6 weeks, 6 months, 1 year and then yearly follow up.

Retrospective study patients were reviewed every yearly.

Patients were assessed radiologically and assessed clinically using Harris Hip score.

Results...

RESULTS

The 20 hips each for unipolar and bipolar were evaluated both clinically and radiologically. Clinical evaluation was done using Harris hip score which reveals the following results

Table 3. Unipolar Hemiarthroplasty – Functional Results

Excellent	3	15%
Good	12	60%
Fair	3	15%
Poor	2	10%

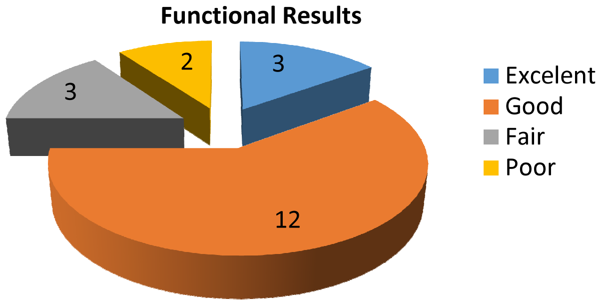


Fig 29. Unipolar Hemiarthroplasty – Functional Results

Table 4. Bipolar Hemiarthroplasty – Functional Results

Excellent	7	35%
Good	9	45%
Fair	3	15%
Poor	1	5%

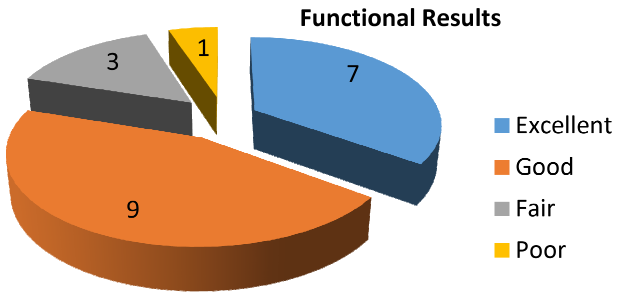


Fig 30. Bipolar Hemiarthroplasty – Functional Results

COMPARISON OF UNCEMENTED UNIPOLAR AND UNCEMENTED BIPOLAR HEMIARTHROPLASTY- FUNCTIONAL RESULTS

Table 5. Uncemented Unipolar Hemiarthroplasty - Functional Results

Excellent	3	30%
Good	3	30%
Fair	2	20%
Poor	2	20%

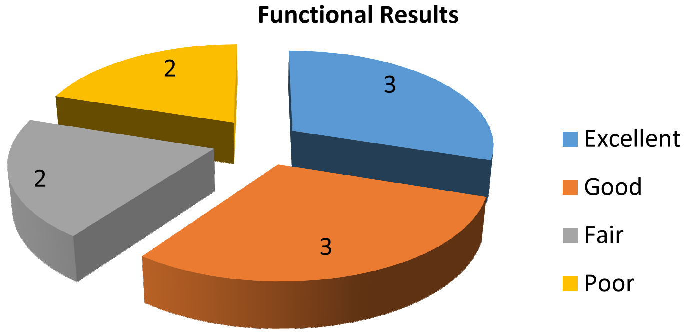


Fig 31. Bipolar Hemiarthroplasty – Functional Results

Table 6. Uncemented Bipolar Hemiarthroplasty - Functional Results

Excellent	5	50%
Good	3	30%
Fair	2	20%
Poor	0	0%

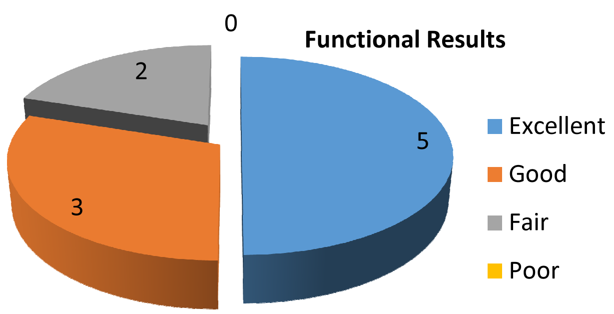


Fig 32. Bipolar Hemiarthroplasty – Functional Results

COMPARISON OF CEMENTED UNIPOLAR AND CEMENTED BIPOLAR HEMIARTHROPLASTY- FUNCTIONAL RESULTS

Table 7. Cemented Unipolar Hemiarthroplasty - Functional Results

Excellent	0	0%
Good	9	90%
Fair	1	10%
Poor	0	0%

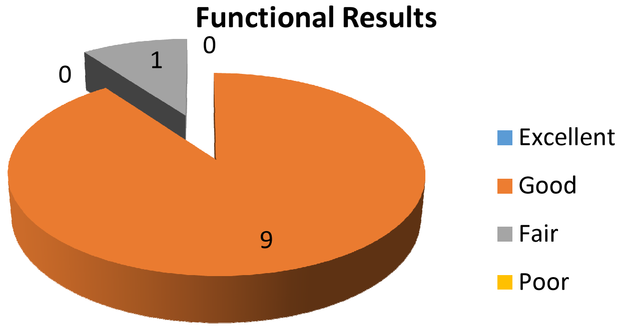


Fig 33. Cemented Unipolar Hemiarthroplasty - Functional Results

Table 8. Cemented Bipolar Hemiarthroplasty - Functional Results

Excellent	2	20%
Good	6	60%
Fair	1	10%
Poor	1	10%

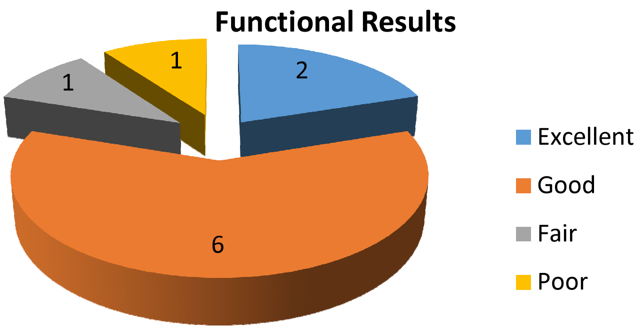
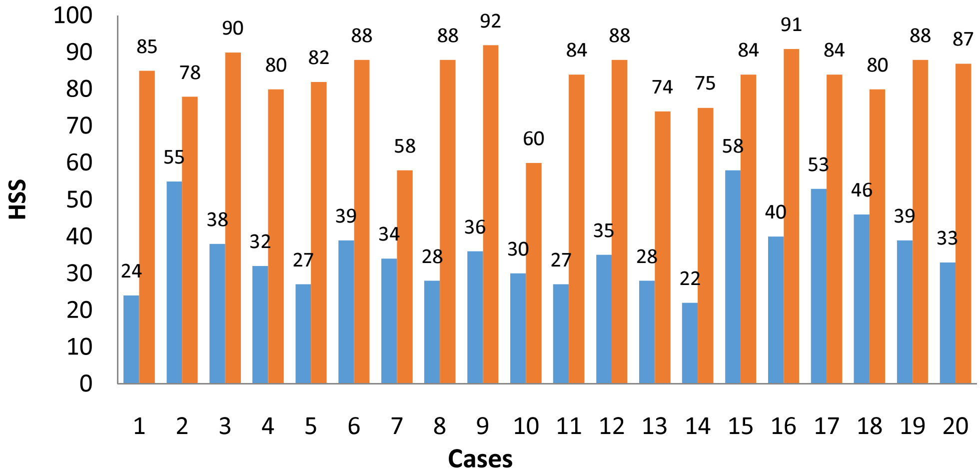


Fig 34. Cemented Bipolar Hemiarthroplasty - Functional Results

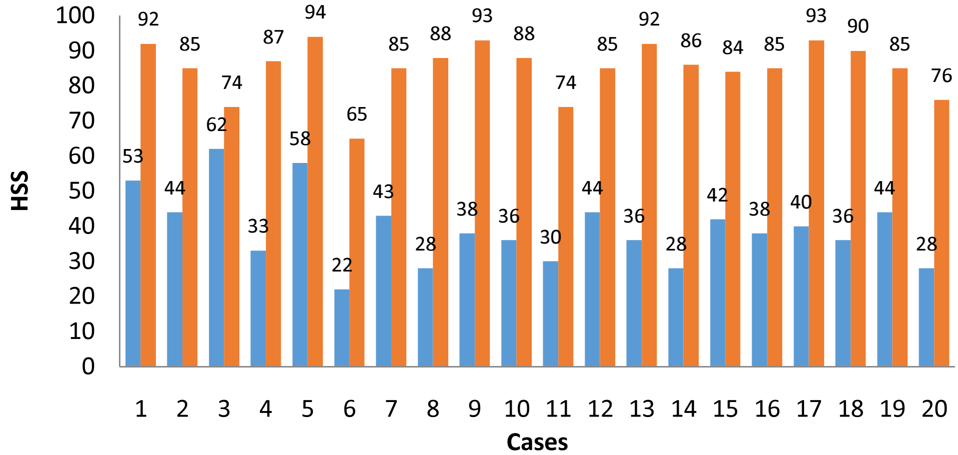
Table 9. Comparison of Pre-op and latest Harris hip score of Unipolar and Bipolar Hemiarthroplasty

	Mean pre-op HHS	Mean latest HHS	Mean Difference in HHS
Unipolar	36.2	81.8	45.6
Bipolar	39.1	85.05	45.95



Average latest HHS 81.8

Fig 35. Comparison of Pre-op and latest Harris hip score of Unipolar Hemiarthroplasty



Average latest HHS 85.05

Fig 36. Comparison of Pre-op and latest Harris hip score of Unipolar Hemiarthroplasty

COMPLICATIONS OF UNIPOLAR HEMIARTHROPLASTY:

- Heterotopic Ossifications → 1 (5%)
- Limb Length discrepancy → 2 (10%)
- Sciatic nerve palsy → 1 (5%)
- Periprosthetic fracture → 1 (5%)
- Acetabular erosion → 2 (10%)

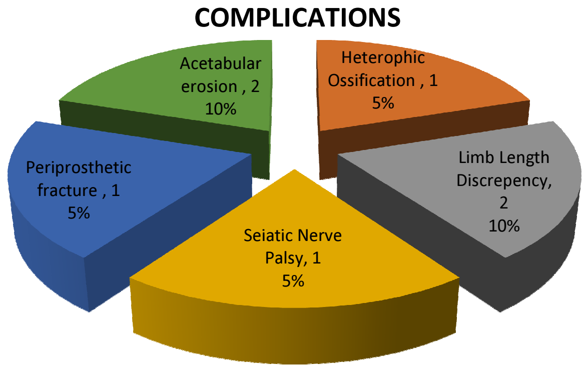


Fig 37. Complications of Unipolar Hemiarthroplasty

COMPLICATIONS OF BIPOLAR HEMIARTHROPLASTY:

- Heterotopic Ossifications → 1 (5%)
- Limb Length discrepancy → 1 (5%)
- Sciatic nerve palsy → 1 (5%)
- Periprosthetic fracture → 1 (5%)
- Acetabular erosion → 1 (1%)

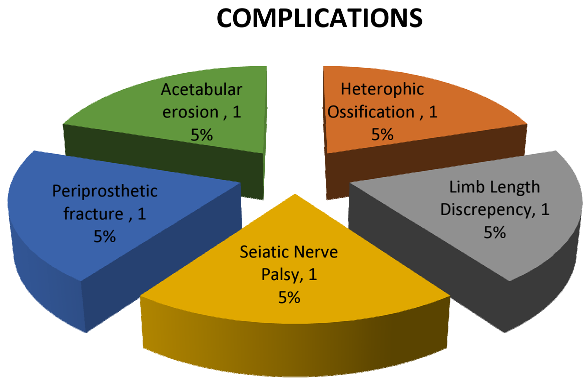


Fig 38. Complications of Bipolar Hemiarthroplasty

RADIOLOGICAL EVALUATION:

UNIPOLAR HEMIARTHROPLASTY:

Table 10. Radiological evaluation -Stem position in Unipolar cases

Stem Position	No.	Percentage
Neutral	13	65%
Valgus	2	10%
Varus	5	25%

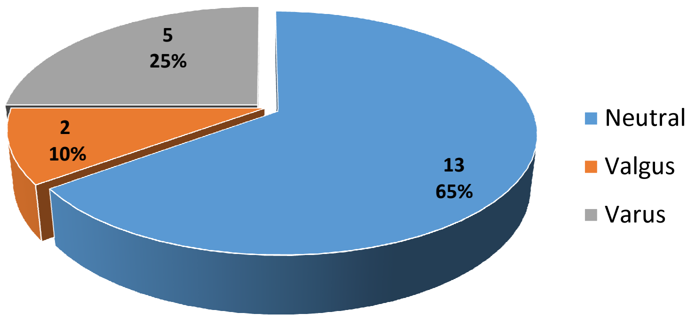


Fig 39. Radiological evaluation - Stem position in Bipolar cases

BIPOLAR HEMIARTHROPLASTY:

Table 11. Radiological evaluation: Stem position in Bipolar cases

Stem Position	No.	Percentage
Neutral	16	80%
Valgus	1	5%
Varus	3	15%

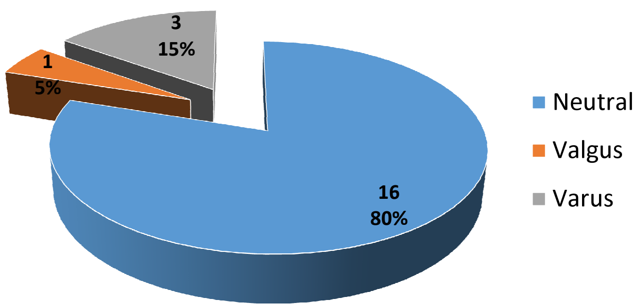


Fig 40. Radiological evaluation - Stem position in Bipolar cases

COMPARISON OF UNCEMENTED UNIPOLAR AND UNCEMENTED BIPOLAR HEMIARTHROPLASTY- RADIOLOGICAL RESULTS

Table 12. Uncemented Unipolar Hemiarthroplasty - Radiological Results

Centre	6	60%
Varus	2	20%
Valgus	2	20%

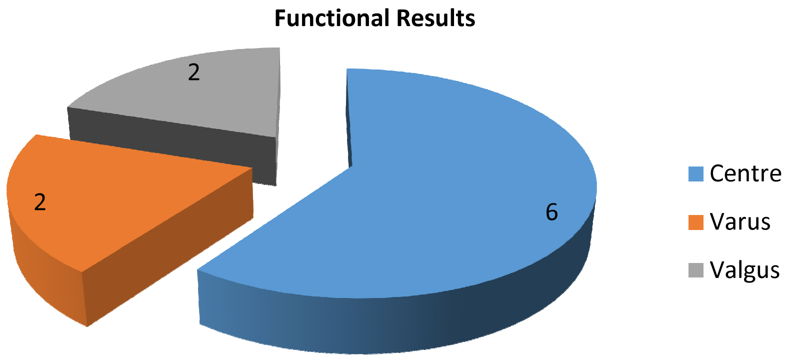


Fig 41. Uncemented Unipolar Hemiarthroplasty - Radiological Results

Table 13. Uncemented Bipolar Hemiarthroplasty - Radiological Results

Centre	8	80%
Varus	2	20%
Valgus	0	0%

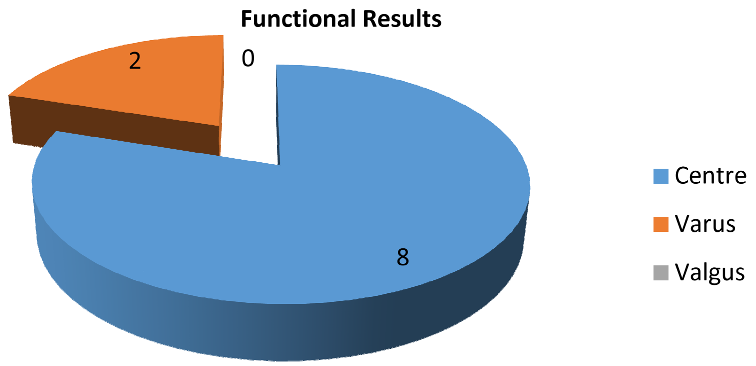


Fig 42. Uncemented Bipolar Hemiarthroplasty - Radiological Results

COMPARISON OF CEMENTED UNIPOLAR AND CEMENTED BIPOLAR HEMIARTHROPLASTY- RADIOLOGICAL RESULTS

Table 14. Cemented Unipolar Hemiarthroplasty - Radiological Results

Centre	7	70%
Varus	3	30%
Valgus	0	0%

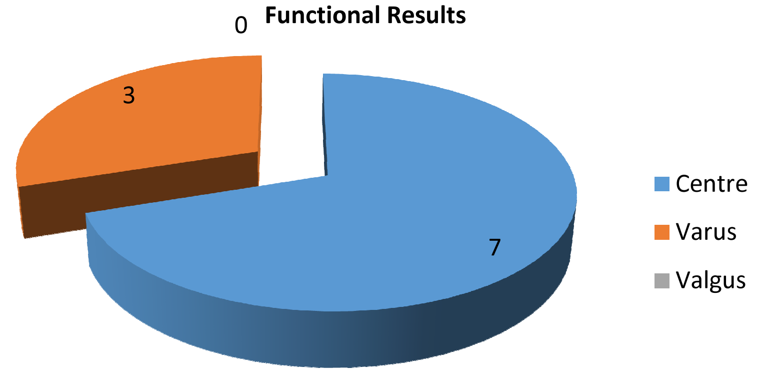


Fig 43. Cemented Unipolar Hemiarthroplasty - Radiological Results

Table 15. Cemented Bipolar Hemiarthroplasty - Radiological Results

Centre	8	80%
Varus	1	10%
Valgus	1	10%

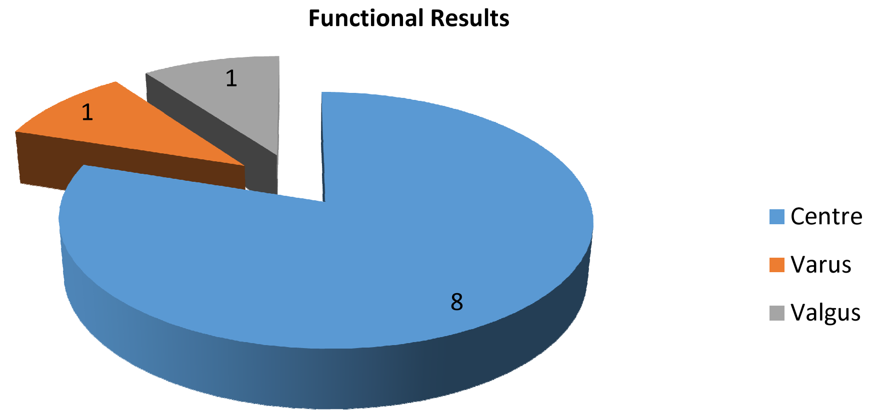


Fig 44. Cemented Bipolar Hemiarthroplasty - Radiological Results

CLINICAL EVALUATION:

Clinical evaluation was done pre-operatively and post-operatively at regular intervals using Harris Hip Score, which takes into account pain, function, deformity and range of motion.

1. Pain:

The location of pain was recorded as in the groin, the buttocks, the lateral or trochanteric area, the anterior aspect of the thigh or diffuse. Pre-operatively no hips had a harris hips score of 44 or 40 in either group. Post operatively 2 hips had a score of 30 points in unipolar and 1 hip had a score of 30 points in Bipolar. 15 hips had a score of 40 points in unipolar and 13 hips had a score of 40 points in bipolar group. 3 hips in unipolar had 44 points and 7 hips in bipolar had 44 points and no hips in either groups had 0 points. At the latest follow up, 9 hips in bipolar and 8 hips in unipolar had score of 44 points. 7 hips in bipolar and 6 in unipolar had 40 points and no hips had 0 point in either group.

2. Limp:

Pre-operatively 7 hips had harris hip score of 11 points in unipolar and 6 hips had a Harris hips score of 11 points in bipolar. 4 hips had a score of 8 points in unipolar and 6 hips had a score of 8 points in bipolar. 6 hips had a score of 5 points in unipolar and bipolar respectively and no hip had 0 points. At latest follow up, no hips had limping in either group.

3. Support:

Pre-operatively 6 hips had harris hip score of 11 points in unipolar and 15 hips had harris hips score of 11 points in bipolar. 12 hips in unipolar had harris hip score of 7 points and 5 hips had harris hips score of 7 points in bipolar. Both groups had harris hip score of 5 points and no group had 2 or 0 point. In the latest follow up, 10 hips in unipolar had a harris hips score of 11 point and 14 hips had harris hips-score of 11 points and no hips had 0 points.

4. Walking Distance:

Before surgery 10 hips had 11 points in unipolar and 16 hips had 11 points in bipolar 4 hips in unipolar had 8 points and 6 hips in bipolar had 8 points 3 hips in unipolar had 5 points and 1 hip in bipolar had 5 points. No hips in either group had 0 points. At the latest follow up, 14 hips in unipolar had harris hips score of 11 points and 18 hips in bipolar had harris hip score of 11 points and no hips in either group had 0 point.

5. Stair Climbing: Before the hip replacement no hips had 4 points, 10 hips in unipolar had 2 points and 13 hips in bipolar had 2 points and, No hip in either group had 0 points. At the latest follow up, 8 hips in unipolar had harris hips score of 4 point and 12 hips in bipolar had harris hip score of 4 points. No hips in either group had 0 points.

6. Range of Motion: Before the operation No hip had harris hip score of 5 points in unipolar and bipolar groups 10 hips had 4 points in unipolar and 13 hips had 4 points in bipolar. 6 hips in unipolar had 3 points and 4 hips in bipolar 3 points. No hips in either groups had 1 point. At the latest follow up, 7 hips in unipolar had harris hips score of 5 points and 10 hips in bipolar had harris hips score of 5 points. No hips in either group had 2 points.

7. Deformity: Before operation 2 hips in unipolar and 1 hip in bipolar had fixed flexion deformity, 1 hip had fixed adduction deformity in unipolar group. While other hips in both the groups had no deformity. At latest follow up, no hips in either group had fixed flexion deformity or fixed adduction deformity.

RADIOLOGICAL EVALUATION

Observations and measurements were made on the antero-posterior radiograph of the pelvis and on the antero-posterior and lateral radiograph of the hip. Radiographic evaluation included.

1. Loosening of the femoral components
2. Femoral stem position
3. Vertical subsidence
4. Heterotopic Ossification

1. **Loosening of the femoral components**

We have no femoral components loosening.

2. **Femoral stem position**

The position of the femoral component in the frontal plane was measured on the anteroposterior radiographs, as previously described. In our study the results were as follows.

		Unipolar	**Bipolar**
• Neutral	-	13 (65%)	16 (80%)
• Valgus	-	2 (10%)	1 (5%)
• Varus	-	5 (25%)	3 (15%)

3. **Vertical subsidence**

Vertical subsidence of the femoral component was measured on the anterioposterior radiographs as previously described. A decrease of 5 mm or more in the vertical position was considered to indicate subsidence. There were no incidence of subsidence in our study.

4. **Heterotopic ossification**

Heterotopic bone when present was graded according to the classification of Brooker et al.[18] In our series we had 2 hips (5%) each in unipolar and bipolar hemiarthroplasty which developed heterotopic type II ossification.

Clinical Examples...

CLINICAL EXAMPLES

UNIPOLAR HEMIARTHROPLASTY

CASE 1 – EXCELLENT RESULT

S. No. 9

Pre op HHS - 36

Latest HHS - 92

Pre op

Post op

CASE 1 – EXCELLENT RESULT

Clinical Photos

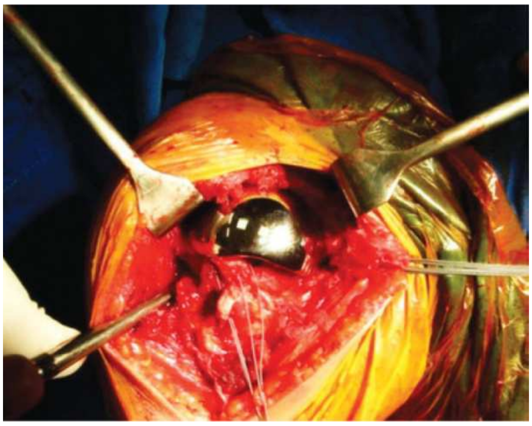
CASE 2 – GOOD RESULT

S.No.6

Pre op HHS - 39

Latest HHS - 88

Pre op



Intra op

Post op

CASE 2 – GOOD RESULT

Clinical Photos

CASE 3 – POOR RESULT

S. No. 7

Pre op HHS - 34

Latest HHS - 58

Pre op

Post op

CASE 3 – POOR RESULT

Clinical Photos

BIPOLAR HEMIARTHROPLASTY

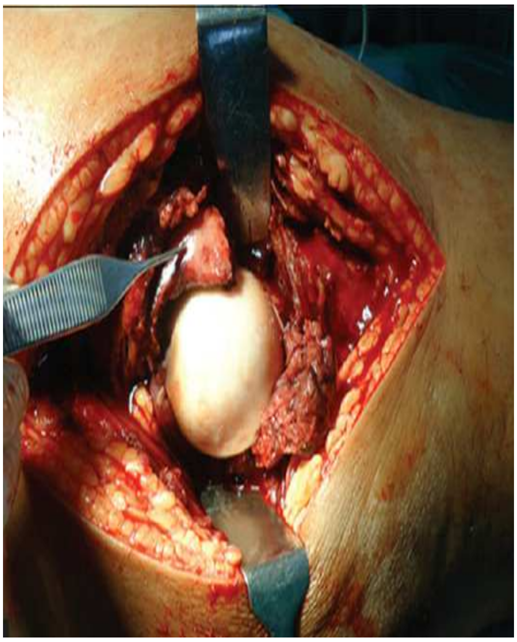
CASE 4 – EXCELLENT RESULT

S.No. 1

Pre op HHS - 53

Latest HHS - 92

Pre op



Intra op

Post op

CASE 4 – EXCELLENT RESULT

Clinical Photos

CASE 5 – GOOD RESULT

S.No. 4

Pre op HHS - 33

Latest HHS - 87

Pre op

Post op

CASE 5 – GOOD RESULT

Clinical Photos

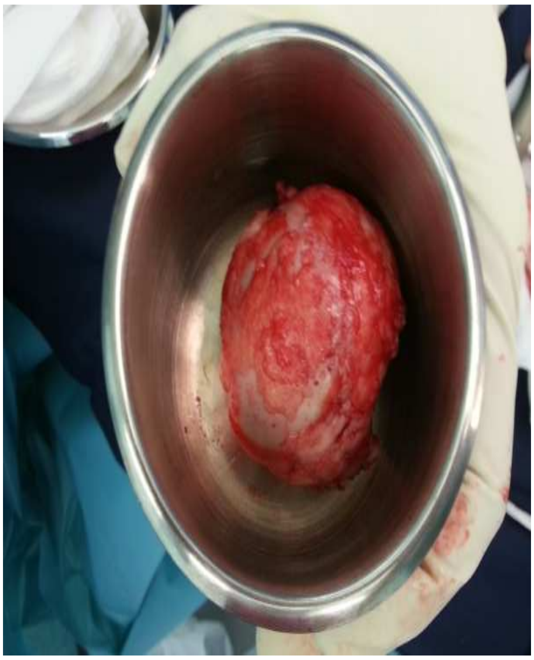
CASE 6 – POOR RESULT

S. No. 6

Pre op HHS - 22

Latest HHS - 65

Pre op



Intra op – Resected femoral head

Post op

CASE 6 – POOR RESULT

Clinical Photos

CASE 7 – COMPLICATION

S.No. 11(II)

Heterotopic ossification

S.No. 7(I)

Periprosthetic fracture

S.No. 10(I)

sciatic nerve palsy

Discussion...

DISCUSSION

Hemiarthroplasty, as an effective technique for femoral neck fractures, could help early ambulation and satisfied function recovery and is increasingly performed by the surgeons.[20-22] However, controversy has persisted for a long time regarding the use of bipolar versus unipolar prosthesis. This study suggests that (1) Bipolar hemiarthroplasty is associated with similar or better improvement in hip functionality, hip pain, and quality of life compared with Unipolar hemiarthroplasty while with a higher cost and that (2) there are no significant differences between Bipolar hemiarthroplasty and Unipolar hemiarthroplasty with regard to operation time, blood loss, blood transfusion, hospital stay, mortality, reoperation, dislocation, and complications, and that (3) Bipolar hemiarthroplasty could not decrease acetabular erosion rate in the long term.

Compared with Unipolar hemiarthroplasty, bipolar prosthesis with an additional inner articulation has the theoretical advantages of less acetabular erosion and less dislocation.[23-24]

This study demonstrates that the incidence of acetabular erosion in Bipolar hemiarthroplasty is less than that in the Unipolar hemiarthroplasty group at the follow-ups. However, statistical difference was only noted at 1 year follow-up and the acetabular erosion rate increased at the later follow-ups. This may be because the bipolar articulation loses mobility with time and functions as a Unipolar hemiarthroplasty.[19] Regarding to dislocation, it is not proved to be less comparing Bipolar hemiarthroplasty with Unipolar hemiarthroplasty in this study.

DISCUSSION OF CLINICAL OUTCOME

Discussion of clinical outcome includes the following

1. Pain
2. Limp
3. Support
4. Walking distance
5. Stair climbing
6. Range of movements
7. Limb length discrepancy

1. Pain:

Pain in the thigh is generally associated with the use of femoral stems that were designed for ingrowth of bone than cemented ones. In all of our patients, the pain decreased with time and were pain free at 6 months post surgery.

In our study, all the patients had good pain relief after 6 months of post surgery in their hips. In our study, patients who had poor outcome also had good pain relief in hip, but the patient's ipsilateral knees were diagnosed to have osteoarthritis.

2. Limp:

In our study, postoperatively none of our patients had limp. All our cases were done through posterior approach. Hardinge[25] believed that limp occurred less frequently when a posterior approach is used.(jbjs 64 b 17-19 1982).

3. Support (walking aids):

In our study, all patients are walking without any support except patients with poor outcome, uses walker support for mobilization. These patients with poor outcome had ipsilateral osteoarthritis knee joint, hence these patients walk with walker support.

4. Walking Distance:

Preoperatively none of the patients were unable to walk for unlimited distance. Post operatively patients with excellent and good results were able to walk for 6 blocks, patients with fair result were able to walk 2-4 blocks and patients with poor results were able to walk indoor only with walker support.

5. Stair Climbing:

Preoperatively all the 40 patients were finding difficulty to climb stairs, postoperatively patients with excellent results were able to climb stairs without railing. Good results patients were using rails to climb stairs. Patients who had the poor outcome were not able to use stairs.

6. **Range of motion:**

After surgery other than poor results patients rest had fairly good range of movements.

7. Limb length discrepancy:

Equalization of leg length with a hemiarthroplasty remains a challenge. Frequently the procedure is completely successful except for an unexpected leg length inequality. Foot wear correction was given to the above patients Discrepancies of 1 cm generally are well tolerated, and perception of the discrepancy tends to diminish with time. Apparent leg length inequality and pelvic obliquity caused by residual soft tissue contracture usually responds to physical therapy with stretching and improve with time.[15] In our study we had 2 patients' with limb length discrepancy i.e. lengthening - 1 cm and 1.5 cm respectively in unipolar and 2 patients in bipolar with one case shortening of about 0.5cm and 1 case lengthening of 0.5 cm respectively.

DISCUSSION OF RADIOLOGICAL OUTCOME

Discussion of the radiological outcome includes the following

1. Implant loosening
2. Acetabular erosion
3. Femoral stem position
4. Subsidence and migration
5. Dislocation
6. Heterotopic ossification

1. **Implant loosening:**

In our study, mean follow up is 48.2 months in unipolar and 46.2 months in bipolar hemiarthroplasty respectively, we did not have any case of implant loosening during our period of follow-up. In our study, we have one case of 84 months of follow up but that patients did not have any implant loosening. However, long-term follow-up if necessary.

2. **Acetabular erosion:**

In our study, of unipolar hemiarthroplasty with a mean followup of 48.2 months we had 2 cases of acetabular erosion and in bipolar hemiarthroplasty with mean followup of 46.2 months we had one acetabular erosion.

3. Femoral stem position:

The ideal femoral stem position is central. In our study, we had 16 stems out of 20 in neutral position (80%) one in valgus (5%) 3 in varus in bipolar hemiarthroplasty. In unipolar, hemiarthroplasty, we had 13(65%) stems out of 20 in neutral position, 2(10%) in valgus and 5(25%) in varus.

4. Subsidence and migration:

In our study, we had no subsidence or migration in unipolar and bipolar hemiarthroplasty.

5. Dislocation:

The incidence of dislocation rate were highest during the immediate post op period but remain elevated throughout the first three post operative months. In our series, we have no cases of dislocation in both unipolar and bipolar hemiarthroplasty.

6. Heterotopic ossification:

Heterotopic ossification is a relatively common complication after hemiarthroplasty. It usually first becomes visible on radiographs three to four weeks after surgery and matures by three to six months.[26,27,28] The incidence of heterotopic ossification ranges from 5% to 90% in various literatures.[29,30]

In our series of bipolar hemiarthroplasty the incidence of heterotopic ossification was 1 out of 20 (5%) and in unipolar hemiarthroplasty the incidence of heterotopic ossification was also 1 out of 20 (5%). The particulate bone debris and the escape of femoral bone marrow elements, which are normally sealed off by bone cement in a cemented femoral component may be increased when an uncemented implant is used.

The increased distribution of bone debris or marrow elements locally could lead to the stimulation (jbjs 73-A: 191-193, Feb 1991) No relationship between the age of patient and formation of new bone was established in our study we had 1 case each of heterotopic ossification in unipolar and bipolar hemiarthroplasty respectively.

Heterotopic ossification was classified follow up period was 83 months as per the Brooker classification.[18] Heterotopic ossification was rated as Brooker Class I in 68 hips, Class II in 17 hips, Class III in 3 hips and Class IV in 2 hips, i.e., 50.7% in Class I, 12.7% in Class II, 2.2% in Class III and 1.5% in Class IV. In our study Class II heterotopic ossification was noted in bipolar hemiarthroplasty.

Pain following hemiarthroplasty is usually due to one of the two pathological processes: articular cartilage degeneration in the acetabulam or loosening of the prosthesis.

In the unipolar study Jadhav AP et al,[31] reported mean age 65.7, Onche and Yinusa showed mean age in the study 67.4, in another study of Essoh J.B Sie M. Da et al reported range of the age 55-88 years with the standard deviation of 7.2. Similarly in this study mean age 69.45was showed as mean ± SD 64.98 ± 4.13. In the study of Ahmed I, 15 reported male female ratio was 1:2. While in this study female were in the majority as compare to male with the 11:9.

According to the unipolar study of Barners CL et al.[32] dislocation rate was 1.5%. Other authors reported 4% dislocation rate. Noor SS,[33] reported 0% dislocation in their study with unipolar hemiarthroplasty. We have 0% dislocation rate because we fasten abduction pillow to the leg postoperatively, for 1 to 2 weeks, along the careful shifting of the patients from theatre table to the bed and also for X-ray. Postoperative wound infection 0% reported by Noor SS,[33] and 7.5% reported by Dinesh Dhar.[34] In general, duration of operation has been proven conclusively to be a potent risk factor in the development of postoperative infection. We have only 4% superficial infection, because all the surgeries were performed by senior surgeons having less operating time with pre and post antibiotic cover and the special care was taken for patients hygiene and theatre condition. And those superficial infection settled well and now patients are not having any infections.

In the study of Anshu Shekhar et al [35] reported outcome of hemiarthroplasty treatment in patients with femoral neck fracture as excellent 43.5%, good 38.4%, fair 11.3% and poor 6.8%. Dinesh Dhar et al[34] reported outcome of Austin-Moore in femur neck fracture outcome excellent 80.2% and fair 19.8%. Noor SS et al[33] reported outcome as, excellent 38%, good 21%, fair 24% and poor 17.3%. Similarly in the present study outcome in 45 remaining patients was as; the excellent results were found in the 44.44% of the study participants, good and satisfied results were seen with the percentage of 26.66% and 20% respectively while poor results were seen in 8.88% of the patients.

Table 16. Comparison of Functional results with previous studies

Functional Result	**Anshu Shekhar et al [35]**	**Our Study**
Excellent	43.5%	15%
Good	38.4%	60%
Fair	11.3%	15%
Poor	6.8%	10%

Table 17. Comparison of Dislocation rate with previous studies

	Barnes et al[32]	**Noor SS[33]**	**Our Study**
Dislocation rate	1.5%	0	0

Conclusion…

CONCLUSION

We have done a short term follow up of functional and radiological outcome of unipolar and bipolar hemiarthroplasty in intracapsular neck of femur fracture.

From our study, we have arrived at the following conclusion:

- Hemiarthroplasty is a challenging surgery due to general condition of those elderly patients and due to the surgical techniques used to pass the operation safely. Otherwise it may lead to several complications.
- Harris hip score is an excellent scoring system for assessing the functional outcome of unipolar and bipolar hemiarthroplasty. We have 15% of Excellent results in unipolar hemiarthroplasty and 35% Excellent results in bipolar hemiarthroplasty respectively. We have 60% good results in unipolar hemiarthroplasty and 45% in bipolar hemiarthroplasty respectively and we have 15% fair result in each unipolar and bipolar hemiarthroplasty respectively.
- The results of our study also shows that uncemented bipolar hemiarthroplasty gave better results when compared with uncemented unipolar hemiarthroplasty. Our results also shows that, cemented bipolar hemiarthroplasty gave better results when compared with cemented unipolar hemiarthroplasty clinically and radiologically.

- The results of our study are rewarding in term of improving patient’s quality of life as evidenced by pre-op and post-op Harris hip score.
- Hemiarthroplasty is an Excellent treatment strategy for intracapsular neck of femur fracture in terms of pain relief and restoration of function and mobility as near as possible to the pre injury level.
- The bipolar hemiarthroplasty done for intracapsular neck of femur fracture gave better functional and radiological results in our study in comparison to the unipolar hemiarthroplasty done for intracapsular neck of femur fracture.
- Acetabular erosion is the most commonly encountered complication in unipolar hemiarthroplasty than the bipolar hemiarthroplasty which had less complication comparatively.
- Our overall mean Harris hip score pre-operatively for unipolar hemi arthroplasty was 36.2 and bipolar hemiarthroplasty was 39.1 which increased to 81.8 for unipolar and 85.05 for bipolar hemiarthroplasty respectively, with the p-value of <0.561.

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Appendices...

SREE MOOKAMBIKA INSTITUTE OF MEDICAL SCIENCES

KULASEKHARAM

RESEARCH COMMITTEE

CERTIFICATE

This is to certify that The Research Protocol Submitted by DR. FAIZAN KHALID SHAH

Faculty / Post Graduate from Department of ORTHOPAEDICS

Titled A STUDY OF FUNCTIANAL AND RADIOLOGICAL OUTCOME OF UNIPOLAR AND BIPOLAR HEMIARTHROPLASTY IN FRACTURE NECK OF FEMUR.

is approved by the Research Committee.

Chair Person

Prof. & H.O.D.
Dept. of Bio-Chemistry
Sree Mookambika Institute of Medical Sciences
Kulasekharam 629 161

Convenor

Prof. & H.O.D.
Dept. of Physiology
Sree Mookambika Institute of Medical Sciences
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Date : 04-12-2015

SREE MOOKAMBIKA INSTITUTE OF MEDICAL SCIENCES

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Institutional Human Ethics Committee (IHEC)

{CDSCO Reg No: ECR/446/Inst/TN/2013}

Ref. No: SMIMS/IHEC/2015/A/28 **Date: 17th February 2016**

CERTIFICATE

This is to certify that the Research Protocol Ref. No. **SMIMS/IHEC/2015/A/28** entitled "A Study of Functional and Radiological Outcome of Unipolar and Bipolar Hemiarthroplasty in Fracture Neck of Femur" submitted by Dr. Faizan Khalid Shah, Postgraduate of Department of Orthopaedics, SMIMS has been approved by the Institutional Human Ethics Committee at its meeting held on 15th December 2015.

17.2.16.

Dr. Rema Menon. N
Member Secretary
Institutional Human Ethics Committee
Professor and HOD of Pharmacology
SMIMS, Kulasekharam (K.K District)
Tamil Nadu-629161

[This Institutional Human Ethics Committee is organized and is operating according to the requirements of ICH-GCP/GLP guidelines and requirements of the Amended Schedule-Y of Drugs and Cosmetics Act, 1940 and Rules 1945 of Government of India.]

CONSENT FORM

PART 1 OF 2

INFORMATION FOR PARTICIPANTS OF THE STUDY

Dear Volunteers,

We welcome you and thank you for your keen interest in participating in this research project. Before you participate in this study, it is important for you to understand why this research is being carried out. This form will provide you all the relevant details of this research. It will explain the nature, the purpose, the benefits, the risks, the discomfort, the precautions and the information about how this project will be carried out. It is important that you can read and understand the contents of the form carefully. This form may contain certain scientific terms and hence, if you have any doubts or if you want more information, you are to ask the study personnel or the contact person mentioned below before you give your consent and also at any time during the entire course of the project.

1. Name of the Principal Investigator	**:**	Dr. Faizan Khalid shah Postgraduate-M.D Orthopaedics Sree Mookambika Institute of Medical Sciences, Kulasekharam
2. Name of the Guide	**:**	Dr. Mathew. K.C., MS, Ortho, MRCS, MRCP Professor and HOD Department of Orthopaedics Sree Mookambika Institute of Medical Sciences, Kulasekharam
3. Name of the co-guide	**:**	Dr. R. Sahaya Jose, M.S.Ortho Assistant Professor Department of Orthopaedics Sree Mookambika Institute of Medical Sciences, Kulasekharam
4. Institute: details with Address	**:**	Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District-629161, Tamil Nadu

5. Title of the study:

A Study of functional and radiological outcome of unipolar and bipolar Hemiarthroplasty in fracture neck of femur.

6. Background Information:

Fracture neck of the femur and its complications account for significant morbidity and mortality Unipolar and bipolar hemiarthroplasty helps in the mobility of the patient as well as prolonging their productive life

7. Aims and Objectives:

To evaluate the short term functional and radiological outcome of unipolar versus Bipolar hemiarthroplasty in intracapsular neck of femur fracture.

8. Scientific justification of the study:

Fracture neck of the femur is the most common orthopaedic problem of elderly patients in case of trivial injury due to osteoporotic bone**.** So, the treatment is to regain the normal relative stability to the joint by doing hemiarthroplasty either by unipolar or bipolar prosthesis .It is the best way of management of treating the fracture neck of femur.

9. Procedure of the study:

The commonly used approaches in hemiarthroplasty are :

1. Posterior approach
2. Lateral approach

We have used posterior approach for our study.

In this approach the patient is placed in the true lateral position with the affected limb uppermost. We make a 10 to 15 cm curved incision on the posterior aspect of the greater trochanter. We incise the fascialatae on the lateral aspect of the femur to uncover the vastus lateralis. We lengthen the fascial aspect of the femur to uncover the vastus lateralis. We lengthen the fascial incision superiorly in line with the skin incision and split the fibers of the gluteus maximus by blunt dissection. We internally rotate the hip to put short external rotator muscles on a stretch and to pull the operative field away from the sciatic nerve. We do not go and look for the sciatic nerve, but if it is noticed in our procedure utmost care is taken not to injure it. We detach the muscles close to their femoral insertion and reflect them backward. The posterior aspect of the hip joint capsule is now fully exposed.

The hip joint capsule is incised with a T-shaped fashion. We achieve dislocation of hip by internal rotation, flexion and adduction. Now we remove the femoral head with fractured neck, and excellent exposure of the acetabulum is obtained. As a routine, swabs were taken both from acetabular and femoral side and all our cultures were negative.

Implantation of Cemented Femoral Component

We do cement fixation in patients with a physiologic age greater than 65 years and when the femoral cortex is thin or osteoporotic and a secure press-fit fixation is unlikely.

Then we insert the broaches in approximately 15 degrees of anteversion in relation to the axis of the knee. We maintain correct axial alignment as the broach is inserted. Alternately we impact and extract the broach to facilitate its passage. Because fixation will be achieved with cement, the requirements for absolute stability of the broach are not rigorous as with cementless techniques. If resistance is felt during insertion of the broach, then the area of impingement is most likely distally within the diaphysis. Then we broach to prepare cortical bone in the diaphysis. We do not attempt to impact the broach further because a femoral fracture may occur or the broach may become incarcerated. Now we carry out a trial reduction to determine the limb length with the prosthesis without cement. Since the stem is to be fixed with cement, the depth of insertion of the component is predetermined at this point. Then we finally select component sizes and limb length and stability have been assessed, to dislocate the hip and remove the trial implant.

Then we remove remaining loose cancellous bone from the medial aspect of the proximal femur using straight and angled curettes. Then we do not touch the stem or allow contamination with blood or debris, because this may compromise the cement-implant interface after implantation. Now we change outer gloves and begin preparation of cement.

Then we mix 2 packages of cement for a standard size femoral stem. The cement is moulded into the shape of a sausage and is held in the palm of one hand or in an open plastic container. A medullary plug is not used, for it will trap air and blood in the distal end of the canal. The cement is pushed into the canal with the index finger or thumb of the opposite hand. It is pushed as far distally as the finger will reach. We take care to avoid mixing blood with cement and to keep the bolus of cement intact. After the cavity has been filled, the cement is pressed with the thumb. A mechanical impactor or plunger may be used. A small plastic suction tube may be placed in the femoral canal to allow air and blood to escape while the cement is being inserted and to reduce the hydrostatic pressure.

Have the femoral component immediately available for insertion. Determine the desired amount of anteversion and the medial/lateral position of the stem before insertion. Hold the stem by the head and insert it manually at first. Insert the tip of the stem within the centre of the cement mantle. Use firm even pressure to insert the stem. Have a plastic-tipped head impactor and a mallet immediately available to complete the seating of the stem. Remove the cement from the region of the collar to be certain that the stem has been fully inserted and, if not, impact it further.

Maintain firm pressure on the head of the component as the cement hardens. As the cement enters a doughy phase, cut the cement around the edges of the prosthesis and carefully remove it from the operative field. Do not pull the cement from beneath the component or proximal support may be lost. Carefully inspect the anterior aspect of the femoral neck to be sure no cement protrudes where it may cause impingement and dislocation. Recheck the positioning and the stability of the femoral component. If there is any detectable motion or if fluid extrudes in the bone-cement interface with movement, then it is unstable and must be replaced. If it appears satisfactory, then reduce the hip and check the stability of the hemiarthroplasty.

Implantation of cementless (uncemented) femoral component

We insert the reamer at a point corresponding to the pirisformis fossa. The insertion point is slightly posterior and lateral on the cut surface of the femoral neck. An aberrant insertion point will not allow access to the center of the medullary canal. Then we, after the point of the reamer has been inserted, direct the handle laterally towards the greater trochanter. We aim the reamer down the femur towards the medial femoral condyle. If this cannot be accomplished, we remove additional bone from the medial aspect of the greater trochanter, or varus positioning of the femoral component will result. We use rongeur, a box chisel, or a specialised trochanteric reamer for this purpose. Generally, a groove must be made in the medial aspect of the greater trochanter to allow proper axial reaming of the canal. We insert the reamer to a predetermined point.

We determine the proper depth of insertion of the reamer. We assess the stability of the axial reamer within the canal. No deflection of the tip of the reamer in any plane should be possible. No we proceed with preparation of the proximal portion of the femur. We remove the residual cancellous bone along the medial aspect of the neck with broaches. Then we place the broach precisely as the axial reamers. We rotate the broach to control anteversion. We seat it final to a point where it becomes axially stable within the canal and will not advance further.

We perform this manoeuvre after full muscular relaxation has been obtained. We irrigate any debris out of the acetabulum. Then we insert the appropriate size femoral component. We insert the stem to within a few centimetres of complete seating by hand. We should be certain to reproduce the precise degree of anteversion determined by the driving device provided with the system or a plastic tipped pusher. We use blow of equal force as the component is seated. As the component nears complete seating, it will advance in smaller increments with each blow of the mallet. An audible change in pitch usually can be detected as the stem nears final seating. We removed any debris from the acetabulum and again reduce the hip. We make sure that no soft tissues have been reduced into the joint. Then we confirm the stability of the hemiarthroplasty through a full range of motion.

After reduction of the hip in both the cemented and uncemented hemiarthroplasties, we proceed with repair of the posterior soft tissue envelope. If the capsule has been preserved, then repair it with heavy non absorbable sutures. Reattach the previously tagged tendons of short external rotators to the posterior aspect of the greater trochanter careful reconstruction of the posterior soft tissue envelope may help stabilize the hip postoperatively. Insert 2 closed suction drainage tubes, one deep to the fascia lata and the other in the subcutaneous plane and bring them out through separate stab wounds. Abduct the hip 10 degrees while closing the fascial incision with closely approximated sutures. Close the subcutaneous layer with interrupted absorbable sutures. Close the skin in routine fashion.

10. Expected risk of the participants: No risk.

11. Expected benefits of the research for the participants:

Detect the severity of cirrhosis and presence of complications, thereby helping in appropriate management.

12. Maintenance of confidentiality:

All data collected for the study will be kept confidentially. No personal details will be revealed.

13. Why have I been chosen to be in this study:

For fracture neck of femur to fulfil the inclusion and exclusion criteria of the study

14. How many people will be in the study: 40

15. Agreement of compensation to the participants: No

16. Anticipated prorated payment, if any, to the participants of the study: Nil

17. Can I withdraw from study at any time during the study period: Yes

18. If there is any new finding/information, would I be informed: Yes

19. Expected duration of the participants participation in the study: Regular periodical visit.

20. Any other pertinent information: No

21. Whom do I contact for further information:

For any study related queries, you are free to contact Dr.Faizan Khalid shah Postgraduate-M.SOrthopaedics SMIMS, Kulaseharam Mob No:9751269340 e-mail :clientastwood12@gmail.com

Place:

Date:

Signature of Principal Investigator **Signature of the Participant**

CONSENT FORM (>18 years)

PART 2 OF 2

PARTICIPANTS CONSENT FORM

The details of the study have been explained to me in writing and details have been fully explained to me. I am aware that the results of the study may not be directly beneficial to me but will help in the advancement of medical sciences. I confirm that I have understood the study and had the opportunity to ask questions. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reasons, without the medical care that normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have given details of the study. I fully consent to participate in the study titled “A Study Of Functional And Radiological Outcome of Unipolar And Bipolar Hemiarthroplasty In Fracture Neck Of Femur”.

Serial no/Reference no:

Name of the participant:

Address of the Participant:

Contact number of the Participant:

Signature/Thumb impression of the participant/Legal guardian

Witness

1.
2.

Date:

Place:

PROFORMA

Patient Data :

Name :

Age /Sex :

Hospital No :

Doctor in charge

Diagnosis :

Address :

Telephone No:

Case No :

Presenting complaints

Procedure :

DOA: DOD: DOS:

PRE OP

Side :

Deformity :

Abduction - Adduction ,

Shortening :

Co morbid :

Skin status :

Period of follow up:

Mean follow – up

<u>Intra op</u>

Prosthesis used :

- Cemented -
- Uncemented -

Approach :

Complications :

POST OP

Evaluation

- X ray :
- Harris Hip score (Modified):

Radiological evaluation

1. Position of stem:
    a. Normal.
    b. Varus.
    c. Valgus.

2. Complications

3. Clinical and Radiological photographs

MASTER CHART
UNIPOLAR HEMIARTHROPLASTY (I)

Sl.No	Name	Age	Sex	Side	Cemented/ Uncemented	Follow up Period in months	Pre-op HSS	Recent HSS	Clinical Results	Stem Position	Complications
1	Sur	17	M	L	Cemented	58	24	85	Good	Centre	Nil
2	Ish	63	F	R	Uncemented	84	55	78	Fair	Valgus	Acetabular erosion
3	Gau	64	M	L	Uncemented	18	38	90	Excellent	Centre	Nil
4	Sar	68	F	L	Cemented	66	32	80	Good	Varus	Limb length Discrepancy
5	Ran	78	M	R	Uncemented	12	27	82	Good	Centre	Nil
6	Gov	70	M	L	Cemented	18	39	88	Good	Centre	Nil
7	Ama	66	F	R	Uncemented	18	34	58	Poor	Varus	Sciatic Nerve Palsy
8	Ven	72	M	L	Cemented	48	28	88	Good	Centre	Nil
9	Gav	66	M	R	Uncemented	64	36	92	Excellent	Centre	Nil
10	Sau	75	F	L	Uncemented	74	30	60	Poor	Varus	Periprosthetic fracture
11	Vij	64	F	L	Cemented	43	27	84	Good	Centre	Nil
12	Mad	65	M	L	Cemented	18	35	88	Good	Centre	Limb Length Discrepancy
13	Ram	82	F	R	Uncemented	56	28	74	Fair	Valgus	Acetabular erosion
14	Rad	71	M	R	Cemented	82	22	75	Fair	Centre	Hetrotrophic ossification
15	Har	78	M	L	Cemented	18	58	84	Good	Varus	Nil
16	Ali	69	F	R	Uncemented	12	40	91	Excellent	Centre	Nil
17	Mut	65	M	L	Cemented	66	53	84	Good	Varus	Nil
18	Vij	68	F	L	Uncemented	18	46	80	Good	Centre	Nil
19	Ana	69	M	R	Cemented	46	39	88	Good	Centre	Nil
20	San	66	F	L	Uncemented	78	33	87	Good	Centre	Nil
Mean		69.45	M=11 F=12	L=11 R=8	Cemented =10 Uncemented=10	44.85 Min -12 Max- 84	36.2	81.8	P=0.561		

BIPOLAR HEMIARTHROPLASTY (II)

Sl.No	Name	Age	Sex	Side	Cemented/ Uncemented	Follow up Period in months	Pre-op HSS	Recent HSS	Clinical Results	Stem Position	Complications
1	Rad	75	F	L	Uncemented	42	53	92	Excellent	Centre	Nil
2	Gau	78	M	R	Cemented	12	44	85	Good	Centre	Nil
3	Bin	65	F	L	Uncemented	18	62	74	Fair	Varus	Periprosthethic fracture
4	Yus	68	M	L	Cemented	18	33	87	Good	Centre	Limb length Discrepancy
5	Mar	72	F	R	Uncemented	38	58	94	Excellent	Centre	Nil
6	Aja	76	M	L	Cemented	12	22	65	Poor	Valgus	Sciatic Nerve Palsy
7	Lak	70	F	R	Cemented	64	43	85	Good	Centre	Nil
8	Mur	68	F	L	Cemented	84	28	88	Good	Centre	Nil
9	Val	69	M	R	Uncemented	37	38	93	Excellent	Centre	Nil
10	Raj	68	F	L	Cemented	12	36	88	Excellent	Centre	Nil
11	Tam	78	F	L	Cemented	18	30	74	Fair	Varus	Hetrotrophic ossification
12	Vel	88	M	R	Uncemented	58	44	85	Good	Centre	Nil
13	Bag	84	M	L	Uncemented	37	36	92	Excellent	Centre	Nil
14	Che	86	F	R	Cemented	42	28	86	Good	Centre	Nil
15	Vim	78	F	L	Cemented	18	42	84	Good	Centre	Nil
16	Pal	65	M	R	Uncemented	57	38	85	Good	Centre	Nil
17	Alp	69	F	L	Cemented	74	40	93	Excellent	Centre	Nil
18	Mut	74	M	L	Uncemented	80	36	90	Excellent	Centre	Nil
19	Van	77	F	R	Uncemented	83	44	85	Good	Centre	Nil
20	Bha	84	F	R	Uncemented	78	28	76	Fair	Varus	Nil
Mean		74.6	M=8	L=12	Cemented =10	44.1	39.1	85.05	P=0.561		
			F=12	R=8	Uncemented=10	Min -12					
						Max- 84					